

**BEFORE SUBMITTING YOUR BID**

- 1. Use pen and ink to complete the Bid.**
- 2. Have you signed and completed the Contract Agreement, Offer & Award Forms?**
- 3. As a minimum, the Bidder will submit a Bid Package consisting of the Notice to Contractors, the completed Acknowledgement of Bid Amendments & Submission of Bid Bond Validation Number form, the completed Schedule of Items, 2 copies of the completed Agreement, Offer, & Award form, a Bid Bond or Bid Guarantee, and any other Certifications or Bid Requirements listed in the Bid Book.**
- 4. Have you included prices for all Bid Items? (“Zero is not considered a bid price.”)**
- 5. Have you included a bid guarantee? Acceptable forms are:**
  - A. Bid Bond on the Department’s prescribed form for 5% of the Bid Amount. (Or forms that do not contain any significant variations from the Department’s forms as solely determined by the Department.)**
  - B. Official Bank Check, Cashier’s Check, Certified Check, U.S. Postal Money Order or Negotiable Certificate of Deposit in the amount stated in the Notice to Contractors.**
- 6. If the written Bid is to be sent, Federal Express overnight delivery is suggested as the package is delivered directly to the DOT Headquarters Building in Augusta. Other means, such as U.S. Postal Services’ Express Mail has proven not to be reliable.**

**AND FOR FEDERAL AID PROJECTS**

- 7. Have you included your DBE Proposed Utilization Form in the proper amounts, and furnished the completed form to the Contracts section by 4:30pm on bid opening day?**

**If you need further information regarding Bid preparation, call the DOT Contracts Section at (207)624-3410.**

**For complete specifications regarding bidding requirements, refer to Section 102 of the Maine Department of Transportation, Standard Specifications, Revision December 2002.**

# NOTICE

**The Maine Department of Transportation is attempting to improve the way Bid Amendments/Addendums are handled, and allow for an electronic downloading of bid packages from our website, while continuing to maintain a planholders list.**

**Prospective bidders, subcontractors or suppliers who wish to download a copy of the bid package and receive a courtesy notification of project specific bid amendments, must provide an email address to Diane Barnes at the MDOT Contracts mailbox at: [MDOT.contracts@maine.gov](mailto:MDOT.contracts@maine.gov). Each bid package will require a separate request.**

**Additionally, interested parties will be responsible for reviewing and retrieving the Bid Amendments from our web site, and acknowledging receipt and incorporating those Bid Amendments in their bids using the Acknowledgement of Bid Amendment Form.**

The downloading of bid packages from the MDOT website is not the same as providing an electronic bid to the Department. Electronic bids must be submitted via <http://www.BIDX.com>. For information on electronic bidding contract Rebecca Pooler at [rebecca.pooler@maine.gov](mailto:rebecca.pooler@maine.gov).



# NOTICE

For security and other reasons, all Bid Packages which are mailed, shall be provided in double (one envelope inside the other) envelopes. The *Inner Envelope* shall have the following information provided on it:

Bid Enclosed - Do Not Open

PIN:

Town:

Date of Bid Opening:

Name of Contractor with mailing address and telephone number:

In Addition to the usual address information, the *Outer Envelope* should have written or typed on it:

Double Envelope: Bid Enclosed

PIN:

Town:

Date of Bid Opening:

Name of Contractor:

*This should not be much of a change for those of you who use Federal Express or similar services.*

Hand-carried Bids may be in one envelope as before, and should be marked with the following information:

Bid Enclosed: Do Not Open

PIN:

Town:

Name of Contractor:

**STATE OF MAINE DEPARTMENT OF TRANSPORTATION**  
Bid Guaranty-Bid Bond Form

**KNOW ALL MEN BY THESE PRESENTS THAT**\_\_\_\_\_

\_\_\_\_\_, of the City/Town of \_\_\_\_\_ and State of \_\_\_\_\_

as Principal, and \_\_\_\_\_ as Surety, a

Corporation duly organized under the laws of the State of \_\_\_\_\_ and having a usual place of

Business in \_\_\_\_\_ and hereby held and firmly bound unto the Treasurer of

the State of Maine in the sum of \_\_\_\_\_ for payment which Principal and Surety bind

themselves, their heirs, executors, administrators, successors and assigns, jointly and severally.

The condition of this obligation is that the Principal has submitted to the Maine Department of

Transportation, hereafter Department, a certain bid, attached hereto and incorporated as a

part herein, to enter into a written contract for the construction of \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ and if the Department shall accept said bid

and the Principal shall execute and deliver a contract in the form attached hereto (properly

completed in accordance with said bid) and shall furnish bonds for this faithful performance of

said contract, and for the payment of all persons performing labor or furnishing material in

connection therewith, and shall in all other respects perform the agreement created by the

acceptance of said bid, then this obligation shall be null and void; otherwise it shall remain in full

force, and effect.

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_\_

WITNESS:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

WITNESS

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

PRINCIPAL:

By \_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

SURETY:

By \_\_\_\_\_

By: \_\_\_\_\_

Name of Local Agency: \_\_\_\_\_

# NOTICE

Bidders:

Please use the attached “Request for Information” form when faxing questions and comments concerning specific Contracts that have been Advertised for Bid. Include additional numbered pages as required.

# REQUEST FOR INFORMATION

Response By:\_\_\_\_\_ Date: \_\_\_\_\_

# INSTRUCTIONS FOR PREPARING THE CONTRACTOR'S DISADVANTAGED BUSINESS ENTERPRISE UTILIZATION PLAN

## The Contractor Shall:

1. Submit a completed Contractor's Disadvantaged Business Enterprise Utilization Plan to the Contract's Engineer by 4:30 P.M. on the Bid day.
2. Extend equal opportunity to MDOT certified DBE firms (as listed in MDOT's DBE Directory of Certified Businesses) in the selection and utilization of Subcontractors and Suppliers.

## SPECIFIC INSTRUCTIONS FOR COMPLETING THE FORM:

Insert Contractor name, the name of the person(s) preparing the form, and that person(s) telephone and fax number.

Provide total Bid price, Federal Project Identification Number, and location of the Project work.

In the columns, name each DBE firm to be used, provide the Unit or Item cost of the Work/Product to be provided by the DBE firm, give a brief description of the Work, and the dollar value of the Work.

If no DBE firm is to be utilized, the Contractor must document the reason(s) why no DBE firms are being used. Specific supporting evidence of good faith efforts taken by Contractors to solicit DBE Bidders must be attached. This evidence, as a minimum, includes phone logs, e-mail and/or mail DBE solicitation records, and the documented results of these solicitations.

# NOTICE

## Disadvantaged Business Enterprise Proposed Utilization

The Apparent Low Bidder must submit the Disadvantaged Business Enterprise Proposed Utilization form by close of Business (4:30 P.M.) on Bid day.

The Contractor's Disadvantaged Business Enterprise Proposed Utilization Plan form contains additional information that is required by USDOT.

The Contractor's Disadvantaged Business Enterprise Proposed Utilization Plan form must be used.

A copy of the new Contractor's Disadvantaged Business Enterprise Proposed Utilization Plan and instructions for completing it are attached.

Note: Questions about DBE firms, or to obtain a printed copy of the DBE Directory, contact Equal Opportunity at (207) 624-3066.

MDOT's DBE Directory of Certified firms can also be obtained at [http://www.state.me.us/mdot/humnres/o\\_equalo/cdwbed\\_h.htm](http://www.state.me.us/mdot/humnres/o_equalo/cdwbed_h.htm)

**MaineDOT CONTRACTOR'S DISADVANTAGED BUSINESS ENTERPRISE  
PROPOSED UTILIZATION FORM**

**Low Bidder must furnish this form to Contracts Section Bid Opening day.**

Contractor: \_\_\_\_\_

Telephone: \_\_\_\_\_

Prepared by: \_\_\_\_\_

Fax: \_\_\_\_\_

BID PRICE: \$ \_\_\_\_\_

BID DATE: \_\_\_\_/\_\_\_\_/\_\_\_\_

FEDERAL PIN # \_\_\_\_\_

PROJECT LOCATION: \_\_\_\_\_

TOTAL DBE \_\_\_\_\_ % PARTICIPATION FOR THIS PROJECT

W B E•	D B E•	Firm Name	Unit/Item Cost	Unit #	Description of Work & Item Number	Actual \$ Value
<b>Total &gt;</b>						

Attach supporting evidence to the maximum participation of DBEs on this project. This is a requirement. This evidence must include name of firm(s) contacted, date contacted, and outcome of solicitation.

Equal Opportunity Use:

Form received: \_\_\_\_/\_\_\_\_/\_\_\_\_ Verified by: \_\_\_\_\_

\_\_\_\_ Accepted      \_\_\_\_ Rejected \_\_\_\_\_

cc: ☐ Contracts    ☐ Other \_\_\_\_\_

- WBEs are non-minority women owned firms certified by MaineDOT
  - DBEs are male and minority owned firms certified by MaineDOT
- For a complete list of certified firms go to <http://www.maine.gov/mdot>

State of Maine  
**VENDOR FORM**

For New Vendors & for Updates on Current Vendors

Special Instructions:

PLEASE PRINT CLEARLY

Return this form to:

\* = MUST BE COMPLETED TO PROCESS

ONLY ONE NAME/VENDOR PER FORM

New Vendor	Address Change	Multi Address	Name Change	Contact Update	ID # Change
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Social Security Number\*  
Individual or Sole Proprietor

**OR**

Federal Taxpayer ID Number\*  
Corporation

S

Business name in "DBA" field below.

Please fill in ONE.

E

Business name in "Name" field below.

**This form will affect all transactions with ALL state agencies.**

**NEW:\***

Remit to Address: Individual or Business Name.

Name\*

DBA or C/O

Address\*

Tel #\*

**OLD:**

Old number:

Name

DBA or C/O

Address

Tel #

<input type="text"/>	Is this the same name on your Social Security card?
<input type="text"/>	If not, have you told Social Security about your name change?

Acct #	<input type="text"/>
Provider #	<input type="text"/>

Signature\*

Contact Name

Print Name or Title

Accounts Receivable Contact Name

Date\* (within 3 months)

Phone # if Different or for Contact Info

Vendor Indicators: Enter Y (Yes) For All Categories Listed Below That Apply To This Vendor

Dealer:   
Jobber:   
Individual:   
Minority:

Manufacturer:   
Retailer:   
Partnership:   
Small Business:

Factory Rep:   
Commodity:   
Incorporated:   
In-State:

Information on State Agency Submitting Vendor Form

State Agency* & SHS #	Contact Person Name & Title*	Telephone #*
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Send to: Maine Department of Transportation/ Contracts 16 SHS, Augusta, ME 04333-0014 Attn: Pat Brown

May-04



# INSTRUCTIONS FOR COMPLETING VENDOR FORM

1. **Print Clearly**
2. **All sections marked with an \* must be completed for processing**
3. **Send completed form to requesting State agency OR remit to address at bottom of form.**
4. **Do NOT send by Fax. Only originals will be accepted.**

<b><u>FIELDS</u></b>	<b><u>INFORMATION NEEDED FOR FIELD</u></b>
<i>Instructi ons</i>	<i>Instructions to Vendor from Agency requesting information.</i>
<i>Return to</i>	<i>The location of agency where the form is to be mailed back to. If none use address at bottom of form.</i>
Boxes above	Please check mark all that apply to the vendor. If other, please specify. If it's a new vendor only one will apply: "New Vendor"
Social Security	Individuals, individuals "doing business as", and individuals without a Federal Taxpayer ID #. Use if not using EIN
Federal Taxpayer	Businesses or professionals providing services. (ID # needs to be use for REMITTANCE purposes.) Use if not using SSN
New	Current Information
Old	Old information (If another ID# had been used please put it next to "OLD")
Name	Individual's Name or Business Name. ONLY ONE name per a form.
DBA or C	"Doing business as" or "In Care Of"
Address	REMITTANCE ADDRESS - Street Address OR PO Box (one or the other)
Tel #	Phone Number of individual or business
Signature	Individual or authorized representative of individual or authorized representative of the business
Date	Current Date (no more than 3 months old)
Contact N	Contact person at business

Accounts Receivable Contact Name	Contact person at business for accounts receivables.
Phone #	Phone for Act Rec Contact
Vendor Indicator s	Indicate all that apply for the vendor, as needed
Agency In	For Agency personnel submitting the form. Contact info incase of questions.



## Office of Human Resources

### Equal Opportunity

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## MAINE DEPARTMENT OF TRANSPORTATION

Certified Disadvantaged and Women Business Enterprise

DBE DIRECTORY - MINORITY OWNED

WBE DIRECTORY - WOMEN OWNED

WEBSITE FOR DIRECTORY CAN BE FOUND AT:

[http://www.state.me.us/mdot/humnres/o\\_equalo/cdwbed\\_h.htm](http://www.state.me.us/mdot/humnres/o_equalo/cdwbed_h.htm)

*It is the responsibility of the Contractor to access the DBE Directory at this site in order to have the most current listings.*

**STATE OF MAINE  
DEPARTMENT OF TRANSPORTATION  
KITTERY SCALE - SOUTHBOUND**

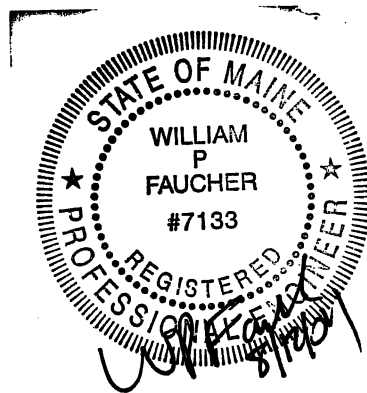
**KITTERY, MAINE**

**SPECIFICATIONS AND DRAWINGS**

MDOT Pin Number.010315.00  
Federal Project No. IM-1031(500)E

*allied engineering, inc.*  
Project No. 03-044

August 12, 2004



**allied** *engineering, inc.*

**FULL SERVICE CONSULTING ENGINEERS**

STRUCTURAL • MECHANICAL • ELECTRICAL • ENVIRONMENTAL • CONSTRUCTION ADMINISTRATION  
One Westbrook Common • Westbrook, Maine 04092-2804 • Telephone 207-854-8126

**KITTERY SCALES**  
**KITTERY – YORK COUNTY**  
**PIN 010315.00**

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Sample Payment Bond  
Sample Performance Bond  
Federal Wage Rate Determination

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**SECTION 3**

**SPECIAL PROVISIONS - TECHNICAL**

**KITTERY SCALES**  
**KITTERY – YORK COUNTY**  
**PIN 010315.00**

**SECTION 1**

## STATE OF MAINE DEPARTMENT OF TRANSPORTATION NOTICE TO CONTRACTORS

Sealed Bids addressed to the Maine Department of Transportation, Augusta, Maine 04333 and endorsed on the wrapper "Bid for Truck Weigh Facility in the town of Kittery" will be received from contractors at the Reception Desk, Maine DOT Building, Child Street, Augusta, Maine, until 11:00 o'clock A.M. (prevailing time) on October 27, 2004, and at that time and place publicly opened and read. Bids will be accepted from contractors prequalified by the Department of Transportation for highway projects. All other Bids may be rejected. MDOT provides the option of electronic bidding. We accept electronic bids for those bid packages posted on the bidx.com website. Electronic bids do not have to be accompanied by paper bids. Please note: the Department will accept a facsimile of the bid bond; however, the original bid bond must then be received at the MDOT Contract Section within 72 hours of the bid opening. During this transition, dual bids (one paper, one electronic) will be accepted, with the paper copy taking precedence.

Description: Maine Federal Aid Project No. IM-1031(500)E, PIN. 10315.00

Location: In York County, project is located on Interstate 95 southbound in Kittery, Maine.

Outline of Work: Truck scales, building construction, site improvements, electrical, curb, paving, septic, water, and other incidental work.

### The Basis of award will be Section 0001

For general information regarding Bidding and Contracting procedures, contact Scott Bickford at (207)624-3410. Our webpage at <http://www.state.me.us/mdot/project/design/homepg.htm> contains a copy of the schedule of items, Plan Holders List, written portions of bid amendments (not drawings), and bid results. For Project-specific information fax all questions to **Project Manager Andy MacDonald** at (207)624-3431. Questions received after 12:00 noon of Monday prior to bid date will not be answered. Bidders shall not contact any other Departmental staff for clarification of Contract provisions, and the Department will not be responsible for any interpretations so obtained. Hearing impaired persons may call the Telecommunication Device for the Deaf at (207) 624-3007.

Plans, specifications and bid forms may be seen at the Maine DOT Building in Augusta, Maine. They may be purchased from the Department between the hours of 8:00 a.m. to 4:30 p.m. by cash, credit card (Visa/Mastercard) or check payable to Treasurer, State of Maine sent to Maine Department of Transportation, Attn.: Mailroom, 16 State House Station, Augusta, Maine 04333-0016. They also may be purchased by telephone at (207)624-3536 between the hours of 8:00 a.m. to 4:30 p.m. Full size plans \$30.00 (\$35.00 by mail). Half size plans \$15.00 (\$19.00 by mail), Bid Book \$10 (\$13 by mail), Single Sheets \$2, payment in advance, all non-refundable.

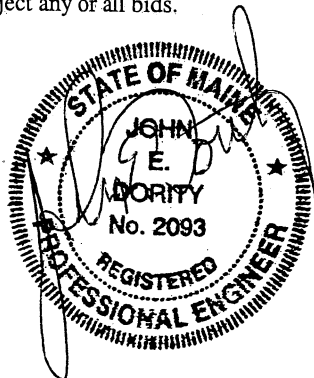
Each Bid must be made upon blank forms provided by the Department and must be accompanied by a bid bond at 5% of the bid amount or an official bank check, cashier's check, certified check, certificate of deposit, or United States postal money order in the amount of \$20,000.00 payable to Treasurer, State of Maine as a Bid guarantee. A Contract Performance Surety Bond and a Contract Payment Surety Bond, each in the amount of 100 percent of the Contract price, will be required of the successful Bidder.

This Contract is subject to all applicable Federal Laws. This contract is subject to compliance with the Disadvantaged Business Enterprise program requirements as set forth by the Maine Department of Transportation.

All work shall be governed by "State of Maine, Department of Transportation, Standard Specifications, Revision of December 2002", price \$10 [\$13 by mail], and Standard Details, Revision of December 2002, price \$20 [\$25 by mail]. Standard Detail updates can be found at <http://www.state.me.us/mdot/project/design/homepg.htm>

The right is hereby reserved to reject any or all bids.

Augusta, Maine  
October 6, 2004



JOHN E. DORITY  
CHIEF ENGINEER

**SPECIAL PROVISION 102.7.3**  
**ACKNOWLEDGMENT OF BID AMENDMENTS**  
**&**  
**SUBMISSION OF BID BOND VALIDATION NUMBER (IF APPLICABLE)**

With this form, the Bidder acknowledges its responsibility to check for all Amendments to the Bid Package. For each Project under Advertisement, Amendments are located at <http://www.maine.gov/mdot/comprehensive-list-projects/project-information.php>. It is the responsibility of the Bidder to determine if there are Amendments to the Project, to download them, to incorporate them into their Bid Package, and to reference the Amendment number and the date on the form below. The Maine DOT will not post Bid Amendments any later than noon the day before Bid opening without individually notifying all the planholders.

Amendment Number	Date

The Contractor, for itself, its successors and assigns, hereby acknowledges that it has received all of the above referenced Amendments to the Bid Package.

CONTRACTOR

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of authorized representative

\_\_\_\_\_  
(Name and Title Printed)



MAINE DEPARTMENT OF TRANSPORTATION

BID

DATE OF OPENING :

CALL ORDER :

CONTRACT ID : 010315.00

PROJECTS

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IM-1031(500)E

COUNTY : YORK

## SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 010315.00

PROJECT(S): IM-1031(500)E

CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
SECTION 0001 TRUCK WEIGH FACILITY ITEMS						
0010	DIV. 1 MOBILIZATION / DEMobilIZATION	LUMP	LUMP			
0020	DIV. 2 SITE CONSTRUCTION	LUMP	LUMP			
0030	DIV. 3 CONCRETE	LUMP	LUMP			
0040	DIV. 5 METALS	LUMP	LUMP			
0050	DIV. 6 WOOD & PLASTIC	LUMP	LUMP			
0060	DIV. 7 THERMAL & MOISTURE PROTECTION	LUMP	LUMP			
0070	DIV. 8 DOORS & WINDOWS	LUMP	LUMP			
0080	DIV. 9 FINISHES	LUMP	LUMP			
0090	DIV. 10 SPECIALTIES	LUMP	LUMP			
0100	DIV. 11 EQUIPMENT	LUMP	LUMP			

## SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 010315.00

PROJECT(S): IM-1031(500)E

CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0110	DIV. 12 FURNISHINGS	LUMP	LUMP			
0120	DIV. 15 MECHANICAL	LUMP	LUMP			
0130	DIV. 16 ELECTRICAL	LUMP	LUMP			
SECTION 0001 TOTAL						
SECTION 0002 ALTERNATES #1 & #2						
0140	ALTERNATES BUILDING DEMOLITION & ROOF DORMERS	LUMP	LUMP			
SECTION 0002 TOTAL						
TOTAL BID						

**MDOT**  
**KITTERY SCALE-SOUTHBOUND**

DESCRIPTION	UNITS	U/M
<b><u>DIVISION 2 - SITE CONSTRUCTION</u></b>		
REMOVE EXISTING PAVEMENT	670	SY
ABANDON EXISTING SEWER SERVICE	1	LS
COMMON EXCAVATION	1,315	CY
EXCAVATION FOR SCALE PIT	550	CY
BACKFILL FOR SCALE PIT	125	CY
AGGREGATE SUBBASE GRAVEL - TYPE D	1,145	CY
AGGREGATE BASE GRAVEL - TYPE A	0	CY
HOT BIT SURFACE PAVEMENT - 12.5 mm	135	TON
HOT BIT BINDER PAVEMENT - 19 mm	220	TON
HOT BITUMINOUS SIDEWALK	16	TON
VERTICAL GRANITE CURB	73	LF
SAW CUT PAVEMENT	1,210	LF
2" WATER MAIN	370	LF
SEPTIC TANK 1500 GALLON	1	LS
PUMP STATION	1	LS
8" GRAVITY SEWER MAIN	10	LF
2" FORCE MAIN	270	LF
DOUBLE CLEANOUT	1	EA
4" UNDERDRAIN	225	LF
6" UNDERDRAIN	180	LF
12" STORM DRAIN	80	LF
CORE EXISTING STRUCTURE	1	EA
CHECK VALVE BACKFLOW PREVENTER FOR SCALE PIT DRAIN	2	EA
EXCAVATION AND BACKFILL FOR PRIMARY ELECTRIC / TELEPHONE	640	LF
EXCAVATION AND BACKFILL FOR SECONDARY ELECTRIC / TELEPHONE	330	LF
LOAM AND SEED	5	UNITS
PAVEMENT MARKINGS	1	LS
EROSION CONTROL MEASURES	1	LS
SITE SIGNAGE	1	LS
GATES	2	EA
JERSEY BARRIER	1	EA

**MDOT  
KITTERY SCALE-SOUTHBOUND**

<b>DIVISION 3 - CONCRETE</b>				
<b>DESCRIPTION</b>	<b>QTY.</b>	<b>UNIT</b>		
<u>SCALE</u>				
FOUNDATION SLAB	1010	SF		
FOUNDATON WALLS	45	CY		
SCALE AND APPROCH SLABS	1280	SF		
<u>BUILDING</u>				
4" SLAB	1300	SF		
PERIMETER FOUNDATION WALLS	35	CY		
PERIMETER FOUNDATION FOOTINGS	20	CY		
VAPOR BARRIER	1300	SF		
PRECAST STAIR /LANDINGS	0	EA		
Entrance Pad	1	EA		

**MDOT**  
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[illegible]

**MDOT**  
**KITTERY SCALE-SOUTHBOUND**

[illegible]

**KITTERY SCALE-SOUTHBOUND**

DIVISION 7 - THERMAL & MOISTURE					
DESCRIPTION	QTY.	UNIT			
FOUNDATION DAMPPROOFING	1	LS			
RIGID INSULATION - 2" at FDN	955	SF			
METAL FLASHING AND TRIM	250	LF			
ROOFING and UNDERLAYMENT	1945.9	SF			
SEALANTS	1	LS			
BUILDING INSULATION - 12" @ Roof	1450	SF			
6" @ Walls	2910	SF			
VAPOR BARRIER	3360	SF			
SIDING	1850	SF			
TRIM AND SPECIALTIES	1	LS			



**MDOT**  
**KITTERY SCALE-SOUTHBOUND**

[illegible]

**MDOT  
KITTERY SCALE-SOUTHBOUND**

[illegible]

**MDOT**  
**KITTERY SCALE-SOUTHBOUND**

[illegible]

**MDOT  
KITTERY SCALE-SOUTHBOUND**

DIVISION 11 - EQUIPMENT			
DESCRIPTION	QTY.	UNIT	
TRUCK SCALE 80' X 75 TON	1	LS	
INSTRUMENTATION / COMPUTER AND SOFTWARE	1	LS	
3 YEAR MAINTENANCE CONTRACT	1	LS	
3 YEAR CONTRACT	1	LS	
4 - 5.5" VISUAL DISPLAYS	4	EA	
12" TRAFFIC LIGHT AND POLE W/ BASE	1	EA	
FIREBALL OVER WEIGHT WARNING SYSTEM	1	EA	
ADDITIONAL (SPARE) LOAD CELLS	2	EA	
INSTALLATION BY MANUFACTURERS TECHS.	1	LS	
SHIPPING	1	LS	

**MDOT  
KITTERY SCALE-SOUTHBOUND**

<b>DIVISION 12 - FURNISHINGS</b>					
<b>DESCRIPTION</b>	<b>QTY.</b>	<b>UNIT</b>			
KITCHEN CASEWORK	1	LS			

**MDOT  
KITTERY SCALE-SOUTHBOUND**

<b>DIVISION 15 - MECHANICAL</b>					
<b>DESCRIPTION</b>	<b>QTY. UNIT</b>				
<b><u>Mechanical Systems</u></b>					
Gas/Electric Split HVAC Unit	1	LS			
Refrigerant Piping	1	LS			
Gas Fired Unit Heater	1	LS			
Flue Piping	1	LS			
Condensate Drain Piping	1	LS			
Electric Baseboard Radiation	1	LS			
Controls	1	LS			
Gravity Ventilator	1	LS			
Exhaust Fan	1	LS			
Sheetmetal	1	LS			
Duct Insulation	1	LS			
Testing, Adjusting & Balancing	1	LS			
<b><u>Plumbing Systems</u></b>					
Shower Unit	1	LS			
Water Closet	1	LS			
Lavatory	1	LS			
Mop Sink	1	LS			
Hydropneumatic Tank	1	LS			
Electric Water Heater	1	LS			
Domestic Hot & Cold Water Piping	1	LS			
Sanitary Waste & Vent Piping	1	LS			
Wall Hydrants	1	LS			
Specialties	1	LS			
Water filtration system	1	LS			

**MDOT**  
**KITTERY SCALE-SOUTHBOUND**

[illegible]

**MDOT**  
**KITTERY SCALE-SOUTHBOUND**

[illegible]



## CONTRACT AGREEMENT, OFFER & AWARD

AGREEMENT made on the date last signed below, by and between the State of Maine, acting through and by its Department of Transportation (Department), an agency of state government with its principal administrative offices located at Child Street Augusta, Maine, with a mailing address at 16 State House Station, Augusta, Maine 04333-0016, and

(Name of the firm bidding the job)

a corporation or other legal entity organized under the laws of the State of Maine, with its principal place of business located at (address of the firm bidding the job)

The Department and the Contractor, in consideration of the mutual promises set forth in this Agreement (the "Contract"), hereby agree as follows:

### A. The Work.

The Contractor agrees to complete all Work as specified or indicated in the Contract including Extra Work in conformity with the Contract, PIN No. 1224.00

for the Hot Mix Asphalt Overlay in the town/city of West Eastport, County of Washington, Maine. The Work includes construction, maintenance during construction, warranty as provided in the Contract, and other incidental work.

The Contractor shall be responsible for furnishing all supervision, labor, equipment, tools supplies, permanent materials and temporary materials required to perform the Work including construction quality control including inspection, testing and documentation, all required documentation at the conclusion of the project, warranting its work and performing all other work indicated in the Contract.

The Department shall have the right to alter the nature and extent of the Work as provided in the Contract; payment to be made as provided in the same.

### B. Time.

The Contractor agrees to complete all Work, except warranty work, on or before November 15, 2003. Further, the Department may deduct from moneys otherwise due the Contractor, not as a penalty, but as Liquidated Damages in accordance with Sections 107.7 and 107.8 of the State of Maine Department of Transportation Standard Specifications, Revision of December 2002.

**C. Price.**

The quantities given in the Schedule of Items of the Bid Package will be used as the basis for determining the original Contract amount and for determining the amounts of the required Performance Surety Bond and Payment Surety Bond, and that the amount of this offer is (Place bid here in alphabetical form such as One Hundred and Two dollars and 10 cents)  
\$ (repeat bid here in numerical terms, such as \$102.10) Performance Bond and Payment Bond each being 100% of the amount of this Contract.

**D. Contract.**

This Contract, which may be amended, modified, or supplemented in writing only, consists of the Contract documents as defined in the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds. It is agreed and understood that this Contract will be governed by the documents listed above.

**E. Certifications.**

By signing below, the Contractor hereby certifies that to the best of the Contractor's knowledge and belief:

1. All of the statements, representations, covenants, and/or certifications required or set forth in the Bid and the Bid Documents, including those in Appendix A to Division 100 of the Standard Specifications Revision of December 2002 (Federal Contract Provisions Supplement), and the Contract are still complete and accurate as of the date of this Agreement.
2. The Contractor knows of no legal, contractual, or financial impediment to entering into this Contract.
3. The person signing below is legally authorized by the Contractor to sign this Contract on behalf of the Contractor and to legally bind the Contractor to the terms of the Contract.

**F. Offer.**

The undersigned, having carefully examined the site of work, the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of:

**PIN 1234.00 West Eastport, Hot Mix Asphalt Overlay**

State of Maine, on which bids will be received until the time specified in the "Notice to Contractors" do(es) hereby bid and offer to enter into this contract to supply all the materials, tools, equipment and labor to construct the whole of the Work in strict accordance with the terms and conditions of this Contract at the unit prices in the attached "Schedule of Items".

The Offeror agrees to perform the work required at the price specified above and in accordance with the bids provided in the attached "Schedule of Items" in strict accordance with the terms of this solicitation, and to provide the appropriate insurance and bonds if this offer is accepted by the Government in writing.

As Offeror also agrees:

First: To do any extra work, not covered by the attached "Schedule of Items", which may be ordered by the Resident, and to accept as full compensation the amount determined upon a "Force Account" basis as provided in the Standard Specifications, Revision of December 2002, and as addressed in the contract documents.

Second: That the bid bond at 5% of the bid amount or the official bank check, cashier's check, certificate of deposit or U. S. Postal Money Order in the amount given in the "Notice to Contractors", payable to the Treasurer of the State of Maine and accompanying this bid, shall be forfeited, as liquidated damages, if in case this bid is accepted, and the undersigned shall fail to abide by the terms and conditions of the offer and fail to furnish satisfactory insurance and Contract bonds under the conditions stipulated in the Specifications within 15 days of notice of intent to award the contract.

Third: To begin the Work on the date specified in the Engineer's "Notice to Commence Work" as stated in Section 107.2 of the Standard Specifications Revision of 2002 and complete the Work within the time limits given in the Special Provisions of this Contract.

Fourth: The Contractor will be bound to the Disadvantaged Business Enterprise (DBE) Requirements contained in the attached Notice (Additional Instructions to Bidders) and submit a completed Contractor's Disadvantaged Business Enterprise Utilization Plan by 4:30pm on the day of bid opening to the Contracts Engineer.

Fifth: That this offer shall remain open for 30 calendar days after the date of opening of bids.

Sixth: The Bidder hereby certifies, to the best of its knowledge and belief that: the Bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of competitive bidding in connection with its bid, and its subsequent contract with the Department.

IN WITNESS WHEREOF, the Contractor, for itself, its successors and assigns, hereby execute two duplicate originals of this Agreement and thereby binds itself to all covenants, terms, and obligations contained in the Contract Documents

\_\_\_\_\_  
Date

\_\_\_\_\_  
(Sign Here)  
(Signature of Legally Authorized Representative  
of the Contractor)

\_\_\_\_\_  
(Witness Sign Here)  
Witness

\_\_\_\_\_  
(Print Name Here)  
(Name and Title Printed)

**G. Award.**

Your offer is hereby accepted.  
documents referenced herein.

This award consummates the Contract, and the

MAINE DEPARTMENT OF TRANSPORTATION

\_\_\_\_\_  
Date

\_\_\_\_\_  
By: David A. Cole, Commissioner

\_\_\_\_\_  
(Witness)

## **CONTRACT AGREEMENT, OFFER & AWARD**

AGREEMENT made on the date last signed below, by and between the State of Maine, acting through and by its Department of Transportation (Department), an agency of state government with its principal administrative offices located at Child Street Augusta, Maine, with a mailing address at 16 State House Station, Augusta, Maine 04333-0016, and

\_\_\_\_\_ a corporation or other legal entity organized under the laws of the State of Maine, with its principal place of business located at \_\_\_\_\_

The Department and the Contractor, in consideration of the mutual promises set forth in this Agreement (the "Contract"), hereby agree as follows:

### **A. The Work.**

The Contractor agrees to complete all Work as specified or indicated in the Contract including Extra Work in conformity with the Contract, PIN No. **10315.00** for **Truck Weigh Scale Facility** in the town of **Kittery**, County of **York**, Maine. The Work includes construction, maintenance during construction, warranty as provided in the Contract, and other incidental work.

The Contractor shall be responsible for furnishing all supervision, labor, equipment, tools supplies, permanent materials and temporary materials required to perform the Work including construction quality control including inspection, testing and documentation, all required documentation at the conclusion of the project, warranting its work and performing all other work indicated in the Contract.

The Department shall have the right to alter the nature and extent of the Work as provided in the Contract; payment to be made as provided in the same.

### **B. Time.**

The Contractor agrees to complete all Work, except warranty work, on or before **June 15, 2005**. Further, the Department may deduct from moneys otherwise due the Contractor, not as a penalty, but as Liquidated Damages in accordance with Sections 107.7 and 107.8 of the State of Maine Department of Transportation Standard Specifications, Revision of December 2002.

### **C. Price.**

The quantities given in the Schedule of Items of the Bid Package will be used as the basis for determining the original Contract amount and for determining the amounts of the required Performance Surety Bond and Payment Surety Bond, and that the amount of this offer is

**Section 0001 \$** \_\_\_\_\_

**Section 0002 \$** \_\_\_\_\_

Performance Bond and Payment Bond each being 100% of the amount awarded under this Contract (see award amount in Section G below).

**D. Contract.**

This Contract, which may be amended, modified, or supplemented in writing only, consists of the Contract documents as defined in the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds. It is agreed and understood that this Contract will be governed by the documents listed above.

**E. Certifications.**

By signing below, the Contractor hereby certifies that to the best of the Contractor's knowledge and belief:

1. All of the statements, representations, covenants, and/or certifications required or set forth in the Bid and the Bid Documents, including those in Appendix A to Division 100 of the Standard Specifications Revision of December 2002 (Federal Contract Provisions Supplement), and the Contract are still complete and accurate as of the date of this Agreement.
2. The Contractor knows of no legal, contractual, or financial impediment to entering into this Contract.
3. The person signing below is legally authorized by the Contractor to sign this Contract on behalf of the Contractor and to legally bind the Contractor to the terms of the Contract.

**F. Offer.**

The undersigned, having carefully examined the site of work, the Plans, Standard Specifications Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of:

**PIN. 10315.00 - Truck Weigh Scale Facility - in the town of Kittery,**

State of Maine, on which bids will be received until the time specified in the "Notice to Contractors" do(es) hereby bid and offer to enter into this contract to supply all the materials, tools, equipment and labor to construct the whole of the Work in strict accordance with the terms and conditions of this Contract at the unit prices in the attached "Schedule of Items".

The Offeror agrees to perform the work required at the price specified above and in accordance with the bids provided in the attached "Schedule of Items" in strict accordance with the terms of this solicitation, and to provide the appropriate insurance and bonds if this offer is accepted by the Government in writing.

As Offeror also agrees:

First: To do any extra work, not covered by the attached "Schedule of Items", which may be ordered by the Resident, and to accept as full compensation the amount determined upon a "Force Account" basis as provided in the Standard Specifications, Revision of December 2002, and as addressed in the contract documents.

Second: That the bid bond at 5% of the bid amount or the official bank check, cashier's check, certificate of deposit or U. S. Postal Money Order in the amount given in the "Notice to Contractors", payable to the Treasurer of the State of Maine and accompanying this bid, shall be forfeited, as liquidated damages, if in case this bid is accepted, and the undersigned shall fail to abide by the terms and conditions of the offer and fail to furnish satisfactory insurance and Contract bonds under the conditions stipulated in the Specifications within 15 days of notice of intent to award the contract.

Third: To begin the Work on the date specified in the Engineer's "Notice to Commence Work" as stated in Section 107.2 of the Standard Specifications Revision of December 2002 and complete the Work within the time limits given in the Special Provisions of this Contract.

Fourth: The Contractor will be bound to the Disadvantaged Business Enterprise (DBE) Requirements contained in the attached Notice (Additional Instructions to Bidders) and submit a completed Contractor's Disadvantaged Business Enterprise Utilization Plan by 4:30pm on the day of bid opening to the Contracts Engineer.

Fifth: That this offer shall remain open for 30 calendar days after the date of opening of bids.

Sixth: The Bidder hereby certifies, to the best of its knowledge and belief that: the Bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of competitive bidding in connection with its bid, and its subsequent contract with the Department.

IN WITNESS WHEREOF, the Contractor, for itself, its successors and assigns, hereby execute two duplicate originals of this Agreement and thereby binds itself to all covenants, terms, and obligations contained in the Contract Documents.

CONTRACTOR

\_\_\_\_\_  
Date

\_\_\_\_\_  
(Signature of Legally Authorized Representative  
of the Contractor)

\_\_\_\_\_  
Witness

\_\_\_\_\_  
(Name and Title Printed)

**G. Award.**

Your offer is hereby accepted for (see checked boxes):

Section 0001 ☐

Section 0002 ☐

**Contract Amount:** \_\_\_\_\_

This award consummates the Contract, and the documents referenced herein.

MAINE DEPARTMENT OF TRANSPORTATION

\_\_\_\_\_  
Date

\_\_\_\_\_  
By: David A. Cole, Commissioner

\_\_\_\_\_  
Witness



## **CONTRACT AGREEMENT, OFFER & AWARD**

AGREEMENT made on the date last signed below, by and between the State of Maine, acting through and by its Department of Transportation (Department), an agency of state government with its principal administrative offices located at Child Street Augusta, Maine, with a mailing address at 16 State House Station, Augusta, Maine 04333-0016, and

\_\_\_\_\_ a corporation or other legal entity organized under the laws of the State of Maine, with its principal place of business located at \_\_\_\_\_

The Department and the Contractor, in consideration of the mutual promises set forth in this Agreement (the "Contract"), hereby agree as follows:

### **A. The Work.**

The Contractor agrees to complete all Work as specified or indicated in the Contract including Extra Work in conformity with the Contract, PIN No. **10315.00** for **Truck Weigh Scale Facility** in the town of **Kittery**, County of **York**, Maine. The Work includes construction, maintenance during construction, warranty as provided in the Contract, and other incidental work.

The Contractor shall be responsible for furnishing all supervision, labor, equipment, tools supplies, permanent materials and temporary materials required to perform the Work including construction quality control including inspection, testing and documentation, all required documentation at the conclusion of the project, warranting its work and performing all other work indicated in the Contract.

The Department shall have the right to alter the nature and extent of the Work as provided in the Contract; payment to be made as provided in the same.

### **B. Time.**

The Contractor agrees to complete all Work, except warranty work, on or before **June 15, 2005**. Further, the Department may deduct from moneys otherwise due the Contractor, not as a penalty, but as Liquidated Damages in accordance with Sections 107.7 and 107.8 of the State of Maine Department of Transportation Standard Specifications, Revision of December 2002.

### **C. Price.**

The quantities given in the Schedule of Items of the Bid Package will be used as the basis for determining the original Contract amount and for determining the amounts of the required Performance Surety Bond and Payment Surety Bond, and that the amount of this offer is

**Section 0001 \$** \_\_\_\_\_

**Section 0002 \$** \_\_\_\_\_

Performance Bond and Payment Bond each being 100% of the amount awarded under this Contract (see award amount in Section G below).

**D. Contract.**

This Contract, which may be amended, modified, or supplemented in writing only, consists of the Contract documents as defined in the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds. It is agreed and understood that this Contract will be governed by the documents listed above.

**E. Certifications.**

By signing below, the Contractor hereby certifies that to the best of the Contractor's knowledge and belief:

1. All of the statements, representations, covenants, and/or certifications required or set forth in the Bid and the Bid Documents, including those in Appendix A to Division 100 of the Standard Specifications Revision of December 2002 (Federal Contract Provisions Supplement), and the Contract are still complete and accurate as of the date of this Agreement.
2. The Contractor knows of no legal, contractual, or financial impediment to entering into this Contract.
3. The person signing below is legally authorized by the Contractor to sign this Contract on behalf of the Contractor and to legally bind the Contractor to the terms of the Contract.

**F. Offer.**

The undersigned, having carefully examined the site of work, the Plans, Standard Specifications Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of:

**PIN. 10315.00 - Truck Weigh Scale Facility - in the town of Kittery,**

State of Maine, on which bids will be received until the time specified in the "Notice to Contractors" do(es) hereby bid and offer to enter into this contract to supply all the materials, tools, equipment and labor to construct the whole of the Work in strict accordance with the terms and conditions of this Contract at the unit prices in the attached "Schedule of Items".

The Offeror agrees to perform the work required at the price specified above and in accordance with the bids provided in the attached "Schedule of Items" in strict accordance with the terms of this solicitation, and to provide the appropriate insurance and bonds if this offer is accepted by the Government in writing.

As Offeror also agrees:

First: To do any extra work, not covered by the attached "Schedule of Items", which may be ordered by the Resident, and to accept as full compensation the amount determined upon a "Force Account" basis as provided in the Standard Specifications, Revision of December 2002, and as addressed in the contract documents.

Second: That the bid bond at 5% of the bid amount or the official bank check, cashier's check, certificate of deposit or U. S. Postal Money Order in the amount given in the "Notice to Contractors", payable to the Treasurer of the State of Maine and accompanying this bid, shall be forfeited, as liquidated damages, if in case this bid is accepted, and the undersigned shall fail to abide by the terms and conditions of the offer and fail to furnish satisfactory insurance and Contract bonds under the conditions stipulated in the Specifications within 15 days of notice of intent to award the contract.

Third: To begin the Work on the date specified in the Engineer's "Notice to Commence Work" as stated in Section 107.2 of the Standard Specifications Revision of December 2002 and complete the Work within the time limits given in the Special Provisions of this Contract.

Fourth: The Contractor will be bound to the Disadvantaged Business Enterprise (DBE) Requirements contained in the attached Notice (Additional Instructions to Bidders) and submit a completed Contractor's Disadvantaged Business Enterprise Utilization Plan by 4:30pm on the day of bid opening to the Contracts Engineer.

Fifth: That this offer shall remain open for 30 calendar days after the date of opening of bids.

Sixth: The Bidder hereby certifies, to the best of its knowledge and belief that: the Bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of competitive bidding in connection with its bid, and its subsequent contract with the Department.

IN WITNESS WHEREOF, the Contractor, for itself, its successors and assigns, hereby execute two duplicate originals of this Agreement and thereby binds itself to all covenants, terms, and obligations contained in the Contract Documents.

CONTRACTOR

\_\_\_\_\_  
Date

\_\_\_\_\_  
(Signature of Legally Authorized Representative  
of the Contractor)

\_\_\_\_\_  
Witness

\_\_\_\_\_  
(Name and Title Printed)

**G. Award.**

Your offer is hereby accepted for (see checked boxes):

Section 0001 ☐

Section 0002 ☐

**Contract Amount:** \_\_\_\_\_

This award consummates the Contract, and the documents referenced herein.

MAINE DEPARTMENT OF TRANSPORTATION

\_\_\_\_\_  
Date

\_\_\_\_\_  
By: David A. Cole, Commissioner

\_\_\_\_\_  
Witness

BOND # \_\_\_\_\_

CONTRACT PAYMENT BOND  
(Surety Company Form)

KNOW ALL MEN BY THESE PRESENTS: That \_\_\_\_\_  
\_\_\_\_\_ and the State of \_\_\_\_\_, as principal,  
and.....  
a corporation duly organized under the laws of the State of ..... and having a  
usual place of business in .....  
as Surety, are held and firmly bound unto the Treasurer of the State of Maine for the use  
and benefit of claimants as herein below defined, in the sum of  
\_\_\_\_\_ and 00/100 Dollars (\$) )  
for the payment whereof Principal and Surety bind themselves, their heirs, executors and  
administrators, successors and assigns, jointly and severally by these presents.

The condition of this obligation is such that if the Principal designated as Contractor in  
the Contract to construct Project Number \_\_\_\_\_ in the Municipality of  
\_\_\_\_\_ promptly satisfies all claims and demands incurred for all  
labor and material, used or required by him in connection with the work contemplated by  
said Contract, and fully reimburses the obligee for all outlay and expense which the  
obligee may incur in making good any default of said Principal, then this obligation shall  
be null and void; otherwise it shall remain in full force and effect.

A claimant is defined as one having a direct contract with the Principal or with a  
Subcontractor of the Principal for labor, material or both, used or reasonably required for  
use in the performance of the contract.

Signed and sealed this ..... day of ....., 20 ... .

WITNESS:

SIGNATURES:

CONTRACTOR:

Signature.....

.....

Print Name Legibly .....

Print Name Legibly .....

SURETY:

Signature.....

.....

Print Name Legibly .....

Print Name Legibly .....

SURETY ADDRESS:

NAME OF LOCAL AGENCY:

.....

ADDRESS .....

.....

.....

TELEPHONE .....

.....

BOND # \_\_\_\_\_

CONTRACT PERFORMANCE BOND  
(Surety Company Form)

KNOW ALL MEN BY THESE PRESENTS: That \_\_\_\_\_  
\_\_\_\_\_ and the State of \_\_\_\_\_, as principal,  
and.....  
a corporation duly organized under the laws of the State of ..... and having a  
usual place of business .....  
as Surety, are held and firmly bound unto the Treasurer of the State of Maine in the sum  
of \_\_\_\_\_ and 00/100 Dollars (\$ \_\_\_\_\_),  
to be paid said Treasurer of the State of Maine or his successors in office, for which  
payment well and truly to be made, Principal and Surety bind themselves, their heirs,  
executors and administrators, successors and assigns, jointly and severally by these  
presents.

The condition of this obligation is such that if the Principal designated as Contractor in  
the Contract to construct Project Number \_\_\_\_\_ in the Municipality of \_\_\_\_\_  
\_\_\_\_\_ promptly and faithfully performs the Contract, then this  
obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the State  
of Maine.

Signed and sealed this ..... day of ....., 20.....

WITNESSES:

Signature.....  
Print Name Legibly .....

Signature .....  
Print Name Legibly .....

SURETY ADDRESS:

.....  
.....  
.....

TELEPHONE.....

SIGNATURES:

CONTRACTOR:

.....  
Print Name Legibly .....

SURETY:

.....  
Print Name Legibly .....

NAME OF LOCAL AGENCY:

ADDRESS .....  
.....  
.....

General Decision Number: ME030009 07/30/2004 ME9

Superseded General Decision Number: ME020009

State: Maine

Construction Types: Highway

Counties: Aroostook, Franklin, Hancock, Kennebec, Knox, Lincoln, Oxford, Piscataquis, Sagadahoc, Somerset, Waldo and York Counties in Maine.

HIGHWAY CONSTRUCTION PROJECTS excluding major bridging (for example: bascule, suspension and spandrel arch bridges; those bridging waters presently navigating or to be navigatable; and those involving marine construction in any degree); tunnels, building structures in rest area projects and railroad construction.

Modification Number	Publication Date
0	06/13/2003
1	07/30/2004

\* ENGI0004-015 04/01/2004

	Rates	Fringes
Power equipment operators:		
Pavers.....	\$ 16.51	6.70
Rollers.....	\$ 16.51	6.70

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SUME2000-008 10/24/2000

	Rates	Fringes
Carpenter.....	\$ 11.60	1.51
Ironworkers:		
Structural.....	\$ 12.03	1.58
Laborers:		
Drillers.....	\$ 10.00	2.50
Flaggers.....	\$ 6.00	
Guardrail Installers.....	\$ 7.92	
Landscape.....	\$ 7.87	.16
Line Stripper.....	\$ 8.69	.23
Pipelayers.....	\$ 9.21	2.31
Rakers.....	\$ 9.00	1.51
Sign Erectors.....	\$ 10.00	
Unskilled.....	\$ 8.66	1.38
Wheelman.....	\$ 8.50	.43
Power equipment operators:		
Backhoes.....	\$ 11.87	2.05
Bulldozers.....	\$ 12.33	2.88
Cranes.....	\$ 14.06	1.75
Excavators.....	\$ 12.38	2.48
Graders.....	\$ 13.06	3.73
Loaders.....	\$ 11.41	2.87
Mechanics.....	\$ 13.18	2.57
Truck drivers:		
Dump.....	\$ 9.35	3.10
Tri axle.....	\$ 8.70	1.18

Two axle.....\$ 8.56 2.19

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

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#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations

Wage and Hour Division

U.S. Department of Labor

200 Constitution Avenue, N.W.

Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:



Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION

General Decision Number: ME030002 07/30/2004 ME2

Superseded General Decision Number: ME020002

State: Maine

Construction Types: Building

Counties: Aroostook, Franklin, Hancock, Kennebec, Knox, Lincoln, Oxford, Piscataquis, Sagadahoc, Somerset, Waldo, Washington and York Counties in Maine.

Building Construction Projects (does not include single family homes and apartments up to and including 4 stories).

Modification Number	Publication Date
0	06/13/2003
1	09/19/2003
2	10/10/2003
3	11/07/2003
4	07/30/2004

\* BOIL0029-003 10/01/2003

	Rates	Fringes
Boilermaker.....	\$ 25.46	12.72

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CARP1996-002 10/01/2003

	Rates	Fringes
Carpenters:		
Millwright.....	\$ 20.25	8.45

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\* ELEC0490-002 06/01/2003

YORK COUNTY (Townships of Alfred, Lebanon, Sanford, Wells and area south thereof)

	Rates	Fringes
Electrician.....	\$ 23.90	10.81
Teledata System Installer.....	\$ 18.75	10.11

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ELEC0567-002 06/01/2003

AROOSTOOK COUNTY; FRANKLIN COUNTY: Entire County excluding Carthage, Perkins Plantation, Temple, Farmington, Industry Township and area south thereof; LINCOLN COUNTY: Townships of Boothbay, Bristol, Edgecomb, Newcastle, Westport, Wiscasset; OXFORD COUNTY; PISCATAQUIS COUNTY: Entire county excluding Bernard, Bowerbank, Brownville, Greenville, Elliottsville, Lake View, Squaw, Williamsburg Townships and areas south thereof; SAGADAHOC COUNTY: Entire county south of Bowdoin and Bowdoinham Townships; SOMERSET COUNTY: Entire county west of the Kennebec River and north of Starks Townships; YORK COUNTY: Entire county excluding Alfred, Lebanon, Sanford and Wells Township and area south thereof.

	Rates	Fringes
Electricians:.....	\$ 23.88	10.27
Teledata Technician.....	\$ 19.00	8.73

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\* ELEC1253-002 08/01/2003

FRANKLIN COUNTY: Townships of Carthage, Chesterville, Farmington, Industry, Jay, Perkins Pl., New Sharon, Temple, Washington Pl., Wilton; HANCOCK COUNTY; KENNEBEC COUNTY; KNOX COUNTY; LINCOLN COUNTY; PISCATAQUIS COUNTY: Townships of Abbott, Atkinson, Bernard, Blanchard, Bowerbank, Brownville, Dover/Foxcroft, Elliotsville, Greenfield, Guildford, Kingsbury, Little Squaw, Medford, Milo, Monson, Orneville, Parkman, Sangerville, Sebec, Shirley, Squaw, Wellington, Williamsburg, Willimantic; SAGADAHOC COUNTY: Townships of Bowdoin, Bowdoinham, Richmond; SOMERSET COUNTY: Townships of Athens, Bald Mt., Bingham, Brighton Place, Canaan, Carratunk, Cornville, East Moxie, Fairfield, Harmony, Hartland, Indian Pond, Madison, Mayfield, Mercer, Moxie Gore, Norridgewock, Palmyra, Pittsfield, Ripley, Skowhegan, Sonon, Squaretown, Starks, St. Albans, The Forks; WALDO COUNTY; WASHINGTON COUNTY

	Rates	Fringes
Electricians:.....	\$ 22.62	10.95
Teledata Technicians.....	\$ 19.00	8.73

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\* ENGI0004-006 06/01/2004

	Rates	Fringes
Power equipment operators:		
GROUP I.....	\$ 26.08	13.86
GROUP II.....	\$ 25.80	13.86

Group I: Backhoes, Cranes, Excavators, Loaders, Pile Drivers  
Group II: Bulldozers, Rollers

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IRON0496-001 09/16/2003

	Rates	Fringes
Ironworkers:		
Structural and Reinforcing..	\$ 20.15	14.99

---

\* PLUM0716-001 01/13/2004

	Rates	Fringes
Pipefitter (including HVAC work).....	\$ 21.46	11.35

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\* SHEE0017-009 01/01/2004

	Rates	Fringes
Sheetmetal Worker.....	\$ 18.01	12.635

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SUME2000-002 10/24/2000

Rates	Fringes
Bricklayer.....\$ 14.39	
Carpenters: (including acoustical ceiling installation, drywall hanging and batt insulation installation).....\$ 14.09	3.47
Cement Mason/Finisher.....\$ 12.24	1.48
Drywall Finisher.....\$ 14.42	
Elevator Constructor.....\$ 17.63	3.18
Laborers: (including general laborers and brick mason tenders).....\$ 10.59	4.61
Painters:	
Brush, Roller.....\$ 11.03	
Plasterer.....\$ 14.02	
Plumber.....\$ 12.59	1.91
Roofer.....\$ 11.97	1.32
Sprinkler Fitter.....\$ 13.56	2.65

WELDERS - Receive rate prescribed for craft performing  
operation to which welding is incidental.

Unlisted classifications needed for work not included within  
the scope of the classifications listed may be added after  
award only as provided in the labor standards contract clauses  
(29CFR 5.5 (a) (1) (ii)).

In the listing above, the "SU" designation means that rates  
listed under the identifier do not reflect collectively  
bargained wage and fringe benefit rates. Other designations  
indicate unions whose rates have been determined to be  
prevailing.

#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can  
be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on  
a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests  
for summaries of surveys, should be with the Wage and Hour  
Regional Office for the area in which the survey was conducted  
because those Regional Offices have responsibility for the  
Davis-Bacon survey program. If the response from this initial  
contact is not satisfactory, then the process described in 2.)  
and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations

Wage and Hour Division

U.S. Department of Labor

200 Constitution Avenue, N.W.

Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator

U.S. Department of Labor

200 Constitution Avenue, N.W.

Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board

U.S. Department of Labor

200 Constitution Avenue, N.W.

Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION

**KITTERY SCALES**  
**KITTERY – YORK COUNTY**  
**PIN 010315.00**

**SECTION 2**

## **SPECIAL PROVISION**

### **Section 102 Bidding**

All work in this contract governed by the documents herein, including MDOT Standard Specifications, Supplemental Specifications, Standard Details, Supplemental Details Revisions Dec. 2002, and MUTCD (latest edition).

Should any discrepancies occur between the documents herein, MDOT documents, or the MUTCD (latest edition), the more restrictive document shall prevail.

**SPECIAL PROVISION**  
**SECTION 104**  
**PROSECUTION AND PROGRESS**  
General Rights and Responsibilities

104.4.11 Maintaining Use of Facility

The existing truck rest area must be maintained open and accessible during the construction. All closures of areas not within construction limits needs to be coordinated with the MDOT engineer in the field.



**SPECIAL PROVISION**  
(Consolidated Special Provisions)

**SPECIAL PROVISION SECTION 101**  
**CONTRACT INTERPRETATION**

**101.2 Definitions - Closeout Documentation**

Replace the sentence "A letter stating the amount..... DBE goals." with "DBE Goal Attainment Verification Form"

**SPECIAL PROVISION SECTION 102**  
**DELIVERY OF BIDS**  
(Location and Time)

**102.7.1 Location and Time** Add the following sentence "As a minimum, the Bidder will submit a Bid Package consisting of the Notice to Contractors, the completed Acknowledgement of Bid Amendments & Submission of Bid Bond Validation Number form, the completed Schedule of Items, 2 copies of the completed Agreement, Offer, & Award form, a Bid Bond or Bid Guarantee, and any other Certifications or Bid Requirements listed in the Bid Book."

**SPECIAL PROVISION SECTION 103**  
**AWARD AND CONTRACTING**

**103.3.1 Notice and Information Gathering** Change the first paragraph to read as follows: "After Bid Opening and as a condition for Award of a Contract, the Department may require an Apparent Successful Bidder to demonstrate to the Department's satisfaction that the Bidder is responsible and qualified to perform the Work."

**SPECIAL PROVISION SECTION 104**  
**GENERAL RIGHTS AND RESPONSIBILITIES**

Delete the entire Section 104.5.9 and replace with the following:

**104.5.9 Landscape Subcontractors** The Contractor shall retain only Landscape Subcontractors that are certified by the Department's Environmental Office Landscape Unit.

**SPECIAL PROVISION SECTION 105**  
**GENERAL SCOPE OF WORK**

Delete the entire Section 105.6 and replace with the following:

**105.6.1 Department Provided Services** The Department will provide the Contractor with the description and coordinates of vertical and horizontal control points, set by the Department, within the Project Limits, for full construction Projects and other Projects where survey control is necessary. For Projects of 1,500 feet in length, or less: The Department will provide three points. For Projects between 1,500 and 5,000 feet in length: The Department will provide one set of two points at each end of the Project. For Projects in excess of 5,000 feet in length, the Department will provide one set of two points at each end of the Project, plus one additional set of two points for each mile of Project length. For non-full construction Projects and other Projects where survey control is not necessary, the Department will not set any control points and, therefore, will not provide description and coordinates of any control points. Upon request of the Contractor, the Department will provide the Department's survey data management software and Survey Manual to the Contractor, or its survey Subcontractor, for the exclusive use on the Department's Projects.

**105.6.2 Contractor Provided Services** Utilizing the survey information and points provided by the Department, described in Subsection 105.6.1, Department Provided Services, the Contractor shall provide all additional survey layout necessary to complete the Work. This may include, but not be limited to, reestablishing all points provided by the Department, establishing additional control points, running axis lines, providing layout and maintenance of all other lines, grades, or points, and survey quality control to ensure conformance with the Contract. The Contractor is also responsible for providing construction centerline, or close reference points, for all Utility Facilities relocations and adjustments as necessary to complete the Work. When the Work is to connect with existing Structures, the Contractor shall verify all dimensions before proceeding with the Work. The Contractor shall employ or retain competent engineering and/or surveying personnel to fulfill these responsibilities.

The Contractor must notify the Department of any errors or inconsistencies regarding the data and layout provided by the Department as provided by Section 104.3.3 - Duty to Notify Department If Ambiguities Discovered.

**105.6.2.1 Survey Quality Control** The Contractor is responsible for all construction survey quality control. Construction survey quality control is generally defined as, first, performing initial field survey layout of the Work and, second, performing an independent check of the initial layout using independent survey data to assure the accuracy of the initial layout; additional iterations of checks may be required if significant discrepancies are discovered in this process. Construction survey layout

quality control also requires written documentation of the layout process such that the process can be followed and repeated, if necessary, by an independent survey crew.

105.6.3 Survey Quality Assurance It is the Department's prerogative to perform construction survey quality assurance. Construction survey quality assurance may, or may not, be performed by the Department. Construction survey quality assurance is generally defined as an independent check of the construction survey quality control. The construction survey quality assurance process may involve physically checking the Contractor's construction survey layout using independent survey data, or may simply involve reviewing the construction survey quality control written documentation. If the Department elects to physically check the Contractor's survey layout, the Contractor's designated surveyor may be required to be present. The Department will provide a minimum notice of 48 hours to the Contractor, whenever possible, if the Contractor's designated surveyor's presence is required. Any errors discovered through the quality assurance process shall be corrected by the Contractor, at no additional cost to the Department.

105.6.4 Boundary Markers The Contractor shall preserve and protect from damage all monuments or other points that mark the boundaries of the Right-of-Way or abutting parcels that are outside the area that must be disturbed to perform the Work. The Contractor indemnifies and holds harmless the Department from all claims to reestablish the former location of all such monuments or points including claims arising from 14 MRSA § 7554-A. For a related provision, see Section 104.3.11 - Responsibility for Property of Others.

## SPECIAL PROVISION SECTION 106 QUALITY

106.6 Acceptance Add the following to paragraph 1 of A: "This includes Sections 401 - Hot Mix Asphalt, 402 - Pavement Smoothness, and 502 - Structural Concrete - Method A - Air Content."

Add the following to the beginning of paragraph 3 of A: "For pay factors based on Quality Level Analysis, and"

## SPECIAL PROVISION SECTION 107 TIME

107.3.1 General Add the following: "If a Holiday occurs on a Sunday, the following Monday shall be considered a Holiday. Sunday or Holiday work must be approved by the Department, except that the Contractor may work on Martin Luther King Day,

President's Day, Patriot's Day, the Friday after Thanksgiving, and Columbus Day without the Department's approval."

107.7.2 Schedule of Liquidated Damages Replace the table of Liquidated Damages with the following:

From More Than	Up to and Including	Amount of Liquidated Damages per Calendar Day
\$0	\$100,000	\$100
\$100,000	\$300,000	\$200
\$300,000	\$500,000	\$400
\$500,000	\$1,000,000	\$575
\$1,000,000	\$2,000,000	\$750
\$2,000,000	\$4,000,000	\$900
\$4,000,000	and more	\$1,875

### SPECIAL PROVISION SECTION 108 PAYMENT

108.4 Payment for Materials Obtained and Stored First paragraph, second sentence, delete the words "...Delivered on or near the Work site at acceptable storage places."

### SPECIAL PROVISION SECTION 109 CHANGES

109.1.1 Changes Permitted Add the following to the end of the paragraph: "There will be no adjustment to Contract Time due to an increase or decrease in quantities, compared to those estimated, except as addressed through Contract Modification(s)."

109.1.2 Substantial Changes to Major Items Add the following to the end of the paragraph: "Contract Time adjustments may be made for substantial changes to Major Items when the change affects the Critical Path, as determined by the Department"

109.4.4 Investigation / Adjustment In the third sentence, delete the words "subsections (A) - (E)"

#### 109.5.1 Definitions - Types of Delays

B. Compensable Delay Replace (1) with the following; "a weather related Uncontrollable Event of such an unusually severe nature that a Federal Emergency Disaster is declared. The Contractor will only be entitled to an Equitable Adjustment if the Project falls within the geographic boundaries prescribed under the disaster declaration."

109.7.2 Basis of Payment Replace with the following: "Equitable Adjustments will be established by mutual Agreement for compensable items listed in Section 109.7.3-Compensable Items, based upon Unit or Lump Sum Prices. If Agreement cannot be reached, the Contractor shall accept payment on a Force Account basis as provided in Section 109.7.5 - Force Account Work, as full and complete compensation for all Work relating to the Equitable Adjustment."

109.7.3 Compensable Items Replace with the following: "The Contractor is entitled to compensation for the following items, with respect to agreed upon Unit or Lump Sum Prices:

1. Labor expenses for non-salaried Workers and salaried foremen.
2. Costs for Materials.
3. A markup on the totals of Items 1 and 2 of this subsection 109.7.3 for home office overhead and profit of the Contractor, its Subcontractors and suppliers, and any lower tier Subcontractors or suppliers, with no mark-ups on mark-ups.
4. Cost for Equipment, based on Blue Book Rates or leased rates, as set forth in Section 109.7.5(C), or the Contractor's Actual Costs.
5. Costs for extended job-site overhead.
6. Time.
7. Subcontractor quoted Work, as set forth below in Section 109.7.5 (F)."

109.7.5 Force Account Work

C. Equipment

Paragraph 2, delete sentence 1 which starts; "Equipment leased...."

Paragraph 6, change sentence 2 from "The Contractor may furnish..." to read "If requested by the Department, the Contractor will produce cost data to assist the Department in the establishment of such rental rate, including all records that are relevant to the Actual Costs including rental Receipts, acquisition costs, financing documents, lease Agreements, and maintenance and operational cost records."

Add the following paragraph; "Equipment leased by the Contractor for Force Account Work and actually used on the Project will be paid for at the actual invoice amount plus 10% markup for administrative costs."

Add the following section;

“F. Subcontractor Quoted Work When accomplishing Force Account Work that utilizes Subcontractor quoted Work, the Contractor will be allowed a maximum markup of 5% for profit and overhead.”

**SPECIAL PROVISION SECTION 110**  
**INDEMNIFICATION, BONDING, AND INSURANCE**

Delete the entire Section 110.2.3 and replace with the following:

110.2.3 Bonding for Landscape Establishment Period The Contractor shall provide a signed, valid, and enforceable Performance, Warranty, or Maintenance Bond complying with the Contract, to the Department at Final Acceptance.

The bond shall be in the full amount for all Pay Items for work pursuant to Sec 621, Landscape, payable to the “Treasurer - State of Maine,” and on the Department’s forms, on exact copies thereof, or on forms that do not contain any significant variations from the Department’s forms as solely determined by the Department.

The Contractor shall pay all premiums and take all other actions necessary to keep said bond in effect for the duration of the Landscape Establishment Period described in Special Provision 621.0036 - Establishment Period. If the Surety becomes financially insolvent, ceases to be licensed or approved to do business in the State of Maine, or stops operating in the United States, the Contractor shall file new bonds complying with this Section within 10 Days of the date the Contractor is notified or becomes aware of such change.

All Bonds shall be procured from a company organized and operating in the United States, licensed or approved to do business in the State of Maine by the State of Maine Department of Business Regulation, Bureau of Insurance, and listed on the latest Federal Department of the Treasury listing for “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies.”

By issuing a bond, the Surety agrees to be bound by all terms of the Contract, including those related to payment, time for performance, quality, warranties, and the Department’s self-help remedy provided in Section 112.1 - Default to the same extent as if all terms of the Contract are contained in the bond(s).

Regarding claims related to any obligations covered by the bond, the Surety shall provide, within 60 Days of Receipt of written notice thereof, full payment of the entire claim or written notice of all bases upon which it is denying or contesting payment. Failure of the Surety to provide such notice within the 60-day period constitutes the

Surety's waiver of any right to deny or contest payment and the Surety's acknowledgment that the claim is valid and undisputed.

### SPECIAL PROVISION SECTION 401 HOT MIX ASPHALT PAVEMENT

401.18 Quality Control Method A & B Make the following change to paragraph a. QCP Administrator; in the final sentence, change "...certified as a Plant Technician or Paving Inspector..." to "...certified as a Quality Assurance Technologist..."

401.201 Method A Under a. Lot Size, add the following; "Each lot will be divided into a minimum of four sublots for mix properties and five sublots for percent TMD."

### SPECIAL PROVISION SECTION 402 PAVEMENT SMOOTHNESS

Add the following: "Projects to have their pavement smoothness analyzed in accordance with this Specification will be so noted in Special Provision 403 - Bituminous Box."

"402.02 Lot Size Lot size for smoothness will be 1000 lane-meters [3000 lane-feet]. A subplot will consist of 20 lane-meters [50 lane-feet]. Partial lots will be included in the previous lot if less than one-half the size of a normal lot. If greater than one-half the normal lot size, it will be tested as a separate lot."

### SPECIAL PROVISION SECTION 502 STRUCTURAL CONCRETE

502.05 Composition and Proportioning; TABLE #1; NOTE #2; third sentence; Change "...alcohol based saline sealer..." to "alcohol based silane sealer..."

502.0502 Quality Assurance Method A - Rejection by Resident Change the first sentence to read: "For an individual subplot with test results failing to meet the criteria in Table #1, or if the calculated pay factor for Air Content is less than 0.80....."

502.0503 Quality Assurance Method B - Rejection by Resident Change the first sentence to read: "For material represented by a verification test with test results failing to meet the criteria in Table #1, the Department will....."

502.0505 Resolution of Disputed Acceptance Test Results Combine the second and third sentence to read: "Circumstances may arise, however, where the Department may ....."

502.10 Forms and False work

D. Removal of Forms and False work 1., First paragraph; first, second, and third sentence; replace “forms” with “forms and false work”

502.11 Placing Concrete

G. Concrete Wearing Surface and Structural Slabs on Precast Superstructures  
Last paragraph; third sentence; replace “The temperature of the concrete shall not exceed 24° C [75° F] at the time of placement.” with “The temperature of the concrete shall not exceed 24° C [75° F] at the time the concrete is placed in its final position.”

502.15 Curing Concrete First paragraph; replace the first sentence with the following; “All concrete surfaces shall be kept wet with clean, fresh water for a curing period of at least 7 days after concrete placing, with the exception of vertical surfaces as provided for in Section 501.10 (D) - Removal of Forms and False work.”

Second paragraph; delete the first two sentences.

Third paragraph; delete the entire paragraph which starts “When the ambient temperature....”

Fourth paragraph; delete “approved” to now read “...continuously wet for the entire curing period...”

Fifth paragraph; second sentence; change “...as soon as it is possible to do so without damaging the concrete surface.” to “...as soon as possible.”

Seventh paragraph; first sentence; change “...until the end of the curing period.” to “...until the end of the curing period, except as provided for in Section 502.10(D) - Removal of Forms and False work.”

**SPECIAL PROVISION SECTION 503**  
**REINFORCING STEEL**

503.06 Placing and Fastening Change the second paragraph, first sentence from: “All tack welding shall be done in accordance with Section 504, Structural Steel.” to “All tack welding shall be done in accordance with AWS D1.4 Structural Welding Code - Reinforcing Steel.”

**SPECIAL PROVISION SECTION 504**  
**STRUCTURAL STEEL**



504.18 Plates for Fabricated Members Change the second paragraph, first sentence from: "...ASTM A 898/A 898 M..." to "...ASTM A 898/A 898 M or ASTM A 435/A 435 M as applicable and..."

### SPECIAL PROVISION SECTION 535 PRECAST, PRESTRESSED CONCRETE SUPERSTRUCTURE

535.02 Materials Change "Steel Strand for Concrete Reinforcement" to "Steel Strand." Add the following to the beginning of the third paragraph; "Concrete shall be Class P conforming to the requirements in this section. 28 day compressive strength shall be as stated on the plans. Coarse aggregate...."

535.26 Lateral Post-Tensioning Replace the first paragraph; "A final tension..." with "Overstressing strands for setting losses cannot be accomplished for chuck to chuck lengths of 7.6 m [25 ft] and less. In such instances, refer to the Plans for all materials and methods. Otherwise, post-tensioning shall be in accordance with PCI standards and shall provide the anchorage force noted in the Plans. The applied jacking force shall be no less than 100% of the design jacking force."

### SPECIAL PROVISION SECTION 603 PIPE CULVERTS AND STORM DRAINS

603.0311 Corrugated Polyethylene Pipe for Option III Replace the Minimum Mandrel Diameter Table with the following:

Nominal Size US Customary (in)	Minimum Mandrel Diameter (in)	Nominal Size Metric (mm)	Minimum Mandrel Diameter (mm)
12	11.23	300	280.73
15	14.04	375	350.91
18	16.84	450	421.09
24	22.46	600	561.45
30	28.07	750	701.81
36	33.69	900	842.18
42	39.30	1050	982.54
48	44.92	1200	1122.90

### SPECIAL PROVISION SECTION 604 MANHOLES, INLETS, AND CATCH BASINS

604.02 Materials Add the following:

"Tops and Traps	712.07
Corrugated Metal Units	712.08
Catch Basin and Manhole Steps	712.09"

SPECIAL PROVISION SECTION 605  
UNDERDRAINS

605.05 Underdrain Outlets Make the following change:

In the first paragraph, second sentence, delete the words "metal pipe".

SPECIAL PROVISION SECTION 606  
GUARDRAIL

606.02 Materials Delete the entire paragraph which reads "The sole patented supplier of multiple mailbox...." and replace with "Acceptable multiple mailbox assemblies shall be listed on the Department's Approved Products List and shall be NCHRP 350 tested and approved."

Delete the entire paragraph which reads "Retroreflective beam guardrail delineators...." and replace with "Reflectorized sheeting for Guardrail Delineators shall meet the requirements of Section 719.01 - Reflective Sheeting. Delineators shall be fabricated from high-impact, ultraviolet and weather resistant thermoplastic.

606.09 Basis of Payment First paragraph; delete the second and third sentence in their entirety and replace with "Butterfly-type guardrail reflectorized delineators shall be mounted on all W-beam guardrail at an interval of every 10 posts [62.5 ft] on tangents sections and every 5 posts [31.25 ft] on curved sections as directed by the Resident. On divided highways, the delineators shall be yellow on the left hand side and silver/white on the right hand side. On two-way roadways, the delineators shall be silver/white on the right hand side. All delineators shall have retroreflective sheeting applied to only the traffic facing side. Reflectorized guardrail delineators will not be paid for directly, but will be considered incidental to the guardrail items."

SPECIAL PROVISION SECTION 615  
LOAM

615.02 Materials Make the following change:

Organic Content

Percent by Volume

Humus

"5% - 10%", as determined by Ignition Test

SPECIAL PROVISION SECTION 618

## SEEDING

618.01 Description Change the first sentence to read as follows: "This work shall consist of furnishing and applying seed ....." Also remove "and cellulose fiber mulch" from 618.01(a).

618.03 Rates of Application In 618.03(a), remove the last sentence and replace with the following: "These rates shall apply to Seeding Method 2, 3, and Crown Vetch."

In 618.03(c) "1.8 kg [4 lb]/unit." to "1.95 kg [4 lb]/unit."

618.09 Construction Method In 618.09(a) 1, sentence two, replace "100 mm [4 in]" with "25 mm [1 in] (Method 1 areas) and 50 mm [2 in] (Method 2 areas)"

618.15 Temporary Seeding Change the Pay Unit from Unit to Kg [lb].

## SPECIAL PROVISION SECTION 620 GEOTEXTILES

### 620.03 Placement Section (c)

Title: Replace "Non-woven" in title with "Erosion Control".

First Paragraph: Replace first word "Non-woven" with "Woven monofilament".

Second Paragraph: Replace second word "Non-woven" with "Erosion Control".

### 620.07 Shipment, Storage, Protection and Repair of Fabric Section (a)

Replace the third sentence with the following: "Damaged geotextiles, as identified by the Resident, shall be repaired immediately."

### 620.09 Basis of Payment

Pay Item 620.58: Replace "Non-woven" with "Erosion Control"

Pay Item 620.59: Replace "Non-woven" with "Erosion Control"

## SPECIAL PROVISION SECTION 621 LANDSCAPING

621.0036 Establishment Period In paragraph 4 and 5, change "time of Final Acceptance" to "end of the period of establishment". In Paragraph 7, change "Final Acceptance date" to "end of the period of establishment" and change "date of Final Acceptance" to "end of the period of establishment".

## SPECIAL PROVISION SECTION 626 HIGHWAY SIGNING

626.034 Concrete Foundations Add to the following to the end of the second paragraph: "Pre-cast and cast-in-place foundations shall be warranted against leaning and corrosion for two years after the project is completed. If the lean is greater than 2 degrees from normal or the foundation is spalling within the first two years, the Contractor shall replace the foundation at no extra cost."

### SPECIAL PROVISION SECTION 637 DUST CONTROL

637.06 Basis of Payment Add the following after the second sentence of the third paragraph: "Failure by the Contractor to follow Standard Specification or Special Provision - Section 637 and/or the Contractor's own Soil Erosion and Pollution Control Plan concerning Dust Control and/or the Contractor's own Traffic Control Plan concerning Dust Control and/or visible evidence of excessive dust problems, as determined by the Resident, will result in a reduction in payment, computed by reducing the Lump Sum Total by 5% per occurrence per day. The Department's Resident or any other representative of the Department reserves the right to suspend the work at any time and request a meeting to discuss violations and remedies. The Department shall not be held responsible for any delay in the work due to any suspension under this item. Additional penalties may also be assessed in accordance with Special Provision 652 - Work Zone Traffic Control and Standard Specification 656 - Temporary Soil Erosion and Water Pollution Control."

### SPECIAL PROVISION SECTION 639 ENGINEERING FACILITIES

639.04 Field Offices Change the forth to last paragraph from: "The Contractor shall provide a fully functional desktop copier..." to "....desktop copier/scanner..."

### SPECIAL PROVISION SECTION 652 MAINTENANCE OF TRAFFIC

652.3.5 Installation of Traffic Control Devices In the first paragraph, first sentence; change "Signs shall be erected..." to "Portable signs shall be erected..." In the third sentence; change "Signs must be erected so that the sign face..." to "Post-mounted signs must also be erected so that the sign face..."

652.8.2 Other Items Replace the last paragraph with the following: "There will be no payment made under any 652 pay items after the expiration of the adjusted total contract time."

### SPECIAL PROVISION SECTION 653

## POLYSTYRENE PLASTIC INSULATION

653.05 Placing Backfill In the second sentence; change "...shall be not less than 150 mm [6 in] loose measure." to "...shall be not less than 250 mm [10 in] loose measure." In the third sentence; change "...crawler type bulldozer of not more than 390 kg/m<sup>2</sup> [80 lb/ft<sup>2</sup>] ground contact pressure..." to "...crawler type bulldozer of not more than 4875 kg/m<sup>2</sup> [2000 lb/ft<sup>2</sup>] ground contact pressure..."

653.06 Compaction In the last sentence; change "...crawler type bulldozer of not more than 390 kg/m<sup>2</sup> [80 lb/ft<sup>2</sup>] ground contact pressure..." to "...crawler type bulldozer of not more than 4875 kg/m<sup>2</sup> [2000 lb/ft<sup>2</sup>] ground contact pressure..."it]."

## SPECIAL PROVISION SECTION 656

### TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL

656.5.1 If Pay Item 656.75 Provided Replace the second paragraph with the following: "Failure by the Contractor to follow Standard Specification or Special Provision - Section 656 and/or the Contractor's own Soil Erosion and Pollution Control Plan will result in a reduction in payment, computed by reducing the Lump Sum Total by 5% per occurrence per day. The Department's Resident or any other representative of the Department reserves the right to suspend the work at any time and request a meeting to discuss violations and remedies. The Department shall not be held responsible for any delay in the work due to any suspension under this item."

## SPECIAL PROVISION SECTION 703

### AGGREGATES

703.06 Aggregate for Base and Subbase Delete the first paragraph: "The material shall have..." and replace with "The material shall have a minimum degradation value of 15 as determined by Washington State DOT Test Method T113, Method of Test for Determination of Degradation Value (March 2002 version), except that the reported degradation value will be the result of testing a single specimen from that portion of a sample that passes the 12.5 mm [½ in] sieve and is retained on the 2.00 mm [No. 10] sieve, minus any reclaimed asphalt pavement used."

703.07 Aggregates for HMA Pavements Delete the forth paragraph: "The composite blend shall have..." and replace with "The composite blend, minus any reclaimed asphalt pavement used, shall have a Micro-Deval value of 18.0 or less as determined by AASHTO TP 58. In the event the material exceeds the Micro Deval limit, a Washington Degradation test shall be performed. The material shall be acceptable if it has a value of 30 or more as determined by Washington State DOT Test Method T 113, Method of Test for Determination of Degradation Value (March 2002 version) except that the reported degradation value will be the result of testing a single composite specimen from that

portion of the sample that passes the 12.5mm [1/2 inch] sieve and is retained on the 2.00mm [No 10] sieve, minus any reclaimed asphalt pavement used."

703.22 Underdrain Backfill Material Change the first paragraph from "...for Underdrain Type B..." to "...for Underdrain Type B and C..."

## SPECIAL PROVISION SECTION 706

### NON-METALLIC PIPE

706.06 Corrugated Polyethylene Pipe for Underdrain, Option I and Option III Culvert Pipe Change the first sentence from "...300 mm diameters to 900 mm" to "...300 mm diameters to 1200 mm" Delete, in it's entirety, the last sentence which begins "This pipe and resins..." and replace with the following; "The manufacturing plants of polyethylene pipe shall be certified by the Eastern States Consortium. Polyethylene pipe shall be accepted based on third party certification by the AASHTO's National Transportation Product Evaluation Program."

## SPECIAL PROVISION SECTION 709

### REINFORCING STEEL AND WELDED STEEL WIRE FABRIC

709.03 Steel Strand Change the second paragraph from "...shall be 12mm [1/2 inch] AASHTO M203M/M203 (ASTM A416/A416M)..." to "...shall be 15.24 mm [0.600 inch] diameter AASHTO M203 (ASTM A416)..."

## SPECIAL PROVISION SECTION 712

### MISCELLANEOUS HIGHWAY MATERIALS

Add the following:

"712.07 Tops, and Traps These metal units shall conform to the plan dimensions and to the following specification requirements for the designated materials.

Gray iron castings shall conform to the requirements of AASHTO M105, Class 30, unless otherwise designated.

Carbon steel castings shall conform to the requirements of AASHTO M103/M103M. Grade shall be 450-240 [65-35] unless otherwise designated.

Structural steel shall conform to the requirements of AASHTO M183/M183M or ASTM A283/A283M, Grade B or better. Galvanizing, where specified for these units, shall conform to the requirements of AASHTO M111.

712.08 Corrugated Metal Units The units shall conform to plan dimensions and the metal to AASHTO M36/M36M. Bituminous coating, when specified, shall conform to AASHTO M190 Type A.

712.09 Catch Basin and Manhole Steps Steps for catch basins and for manholes shall conform to ASTM C478M [ASTM C478], Section 13 for either of the following material:

- (a) Aluminum steps-ASTM B221M, [ASTM B211] Alloy 6061-T6 or 6005-T5.
- (b) Reinforced plastic steps Steel reinforcing bar with injection molded plastic coating copolymer polypropylene. Polypropylene shall conform to ASTM D 4101.

712.23 Flashing Lights Flashing Lights shall be power operated or battery operated as specified.

- (a) Power operated flashing lights shall consist of housing, adapters, lamps, sockets, reflectors, lens, hoods and other necessary equipment designed to give clearly visible signal indications within an angle of at least 45 degrees and from 3 to 90 m [10 to 300 ft] under all light and atmospheric conditions.

Two circuit flasher controllers with a two-circuit filter capable of providing alternate flashing operations at the rate of not less than 50 nor more than 60 flashes per minute shall be provided.

The lamps shall be 650 lumens, 120 volt traffic signal lamps with sockets constructed to properly focus and hold the lamp firmly in position.

The housing shall have a rotatable sun visor not less than 175 mm [7 in] in length designed to shield the lens.

Reflectors shall be of such design that light from a properly focused lamp will reflect the light rays parallel. Reflectors shall have a maximum diameter at the point of contact with the lens of approximately 200 mm [8 in].

The lens shall consist of a round one-piece convex amber material which, when mounted, shall have a visible diameter of approximately 200 mm [8 in]. They shall distribute light and not diffuse it. The distribution of the light shall be asymmetrical in a downward direction. The light distribution of the lens shall not be uniform, but shall consist of a small high intensity portion with narrow distribution for long distance throw and a larger low intensity portion with wide distribution for short distance throw. Lenses shall be marked to indicate the top and bottom of the lens.

- (b) Battery operated flashing lights shall be self-illuminated by an electric lamp behind the lens. These lights shall also be externally illuminated by reflex-

reflective elements built into the lens to enable it to be seen by reflex-reflection of the light from the headlights of oncoming traffic. The batteries must be entirely enclosed in a case. A locking device must secure the case. The light shall have a flash rate of not less than 50 nor more than 60 flashes per minute from minus 30 °C [minus 20 °F] to plus 65 °C [plus 150 °F]. The light shall have an on time of not less than 10 percent of the flash cycle. The light beam projected upon a surface perpendicular to the axis of the light beam shall produce a lighted rectangular projection whose minimum horizontal dimension shall be 5 degrees each side of the horizontal axis. The effective intensity shall not have an initial value greater than 15.0 candelas or drop below 4.0 candelas during the first 336 hours of continuous flashing. The illuminated lens shall appear to be uniformly bright over its entire illuminated surface when viewed from any point within an angle of 9 degrees each side of the vertical axis and 5 degrees each side of the horizontal axis. The lens shall not be less than 175 mm [7 in] in diameter including a reflex-reflector ring of 13 mm [½ in] minimum width around the periphery. The lens shall be yellow in color and have a minimum relative luminous transmittance of 0.440 with a luminance of 2854° Kelvin. The lens shall be one-piece construction. The lens material shall be plastic and meet the luminous transmission requirements of this specification. The case containing the batteries and circuitry shall be constructed of a material capable of withstanding abuse equal to or greater than 1.21 mm thick steel [No. 18 U.S. Standard Gage Steel]. The housing and the lens frame, if of metal shall be properly cleaned, degreased and pretreated to promote adhesion. It shall be given one or more coats of enamel which, when dry shall completely obscure the metal. The enamel coating shall be of such quality that when the coated case is struck a light blow with a sharp tool, the paint will not chip or crack and if scratched with a knife will not powder. The case shall be so constructed and closed as to exclude moisture that would affect the proper operation of light. The case shall have a weep hole to allow the escape of moisture from condensation. Photoelectric controls, if provided, shall keep the light operating whenever the ambient light falls below 215 lx [20 foot candles]. Each light shall be plainly marked as to the manufacturer's name and model number.

If required by the Resident, certification as to conformance to these specifications shall be furnished based on results of tests made by an independent testing laboratory. All lights are subject to random inspection and testing. All necessary random samples shall be provided to the Resident upon request without cost to the Department. All such samples shall be returned to the Contractor upon completion of the tests.

712.32 Copper Tubing Copper tubing and fittings shall conform to the requirements of ASTM B88M Type A [ASTM B88, Type K] or better.

712.33 Non-metallic Pipe, Flexible Non-metallic pipe and pipe fittings shall be acceptable flexible pipe manufactured from virgin polyethylene polymer suitable for transmitting liquids intended for human or animal consumption.



712.34 Non-metallic Pipe, Rigid Non-metallic pipe shall be Schedule 40 polyvinylchloride (PVC) that meets the requirement of ASTM D1785. Fittings shall be of the same material.

712.341 Metallic Pipe Metallic pipe shall be ANSI, Standard B36.10, Schedule 40 steel pipe conforming to the requirements of ASTM A53 Types E or S, Grade B. End plates shall be steel conforming to ASTM A36/A36M.

Both the sleeve and end plates shall be hot dip galvanized. Pipe sleeve splices shall be welded splices with full penetration weld before galvanizing.

712.35 Epoxy Resin Epoxy resin for grouting or sealing shall consist of a mineral filled thixotropic, flexible epoxy resin having a pot life of approximately one hour at 10°C [50°F]. The grout shall be an approved product suitable for cementing steel dowels into the preformed holes of curb inlets and adjacent curbing. The sealant shall be an approved product, light gray in color and suitable for coating the surface.

712.36 Bituminous Curb The asphalt cement for bituminous curb shall be of the grade required for the wearing course, or shall be Viscosity Grade AC-20 meeting the current requirements of Subsection 702.01 Asphalt Cement. The aggregate shall conform to the requirements of Subsection 703.07. The coarse aggregate portion retained on the 2.36 mm [No. 8] sieve may be either crushed rock or crushed gravel.

The mineral constituents of the bituminous mixture shall be sized and graded and combined in a composite blend that will produce a stable durable curbing with an acceptable texture.

Bituminous material for curb shall meet the requirements of Section 403 - Hot Bituminous Pavement.

712.37 Precast Concrete Slab Portland cement concrete for precast slabs shall meet the requirements of Section 502 - Structural Concrete, Class A.

The slabs shall be precast to the dimension shown on the plans and cross section and in accordance with the Standard Detail plans for Concrete Sidewalk Slab. The surface shall be finished with a float finish in accordance with Subsection 502.14(c). Lift devices of sufficient strength to hold the slab while suspended from cables shall be cast into the top or back of the slab.

712.38 Stone Slab Stone slabs shall be of granite from an acceptable source, hard, durable, predominantly gray in color, free from seams which impair the structural integrity and be of smooth splitting character. Natural color variations characteristic of the deposit will be permitted. Exposed surfaces shall be free from drill holes or indications of drill holes. The granite slabs in any one section of backslope must be all the same finish.

The granite slabs shall be scabble dressed or sawed to an approximately true plane having no projections or depressions over 13 mm [ $\frac{1}{2}$  in] under a 600 mm [2 ft] straightedge or over 25 mm [1 in] under a 1200 mm [4 ft] straightedge. The arris at the intersection of the top surface and exposed front face shall be pitched so that the arris line is uniform throughout the length of the installed slabs. The sides shall be square to the exposed face unless the slabs are to be set on a radius or other special condition which requires that the joints be cut to fit, but in any case shall be so finished that when the stones are placed side by side no space more than 20 mm [ $\frac{3}{4}$  in] shall show in the joint for the full exposed height.

Liftpin holes in all sides will be allowed except on the exposed face.

**SPECIAL PROVISION SECTION 717**  
**ROADSIDE IMPROVEMENT MATERIAL**

717.05 Mulch Binder. Change the third sentence to read as follows:

“Paper fiber mulch may be used as a binder at the rate of 2.3 kg/unit [5 lb/unit].”

**KITTERY SCALES**  
**KITTERY – YORK COUNTY**  
**PIN 010315.00**

**SECTION 3**

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## SECTION 01100 – SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
  - 3. State of Maine Department of Transportation Standard Details revised 2002
  - 4. State of Maine Department of Transportation Best Management Practices for Erosion and Sediment control the "table of contents" of the latest version is dated 1/19/00.
  - 5. Any supplements to any of the above specifications and or standards issued prior to issuance of this specification.

#### 1.2 SECTION INCLUDES

- A. Work Covered by Contract Documents
- B. Contract Method
- C. Contractor's Use of Premises
- D. Work Under Other Contracts
- E. Future Work
- F. Products Ordered in Advance
- G. Specification Formats and Conventions
- H. Drawings Furnished
- I. Examination of the Site Contractor's Duties
- K. Weather Protection
- L. Completion Date
- M. Start Date

#### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

##### SUMMARY OF WORK

MAINE DEPARTMENT OF TRANSPORTATION  
KITTELY SCALE - SOUTHBOUND  
KITTELY, MAINE

01100-1



- A. Project Identification: Project consists of the construction of a new 1400 square foot single story wood framed building, including all site work, mechanical, plumbing, and electrical work as defined in this project manual and the plans. Additionally, a 75 ton multi platform scale, inclusive of foundation, scale and all mechanical, electrical, drainage and computer support systems required to operate this system. The various items of work for this project are hereinafter specified under the respective branch headings of the work or shown on the accompanying drawings and shall be included in the contracts made for the completion of any respective divisions of the work. Such contracts shall also include necessary details reasonably incidental to the proper execution and completion of such work.
  - 1. Project Location: Kittery, Maine
  - 2. Owner Maine Department of Transportation.
- B. Whenever a conflict, contradiction, or discrepancy between any statutes, regulations, plans or specifications, or if the Contractor request clarification of his responsibilities hereunder, it is the Contractor's responsibility to obtain the advance written approval of the Engineer prior to deviating from any of the specifications.
- C. Engineer Identification: The Contract Documents dated August 12, 2004, were prepared for the Project by Allied Engineering, Inc.
- D. Allied Engineering, Inc will provide Construction Administration for this project.

#### 1.4 CONTRACT METHOD

- A. Project will be constructed under a single lump sum contract.

#### 1.5 CONTRACTOR'S USE OF PREMISES

- A. Confine operations at site to areas permitted by:
  - 1. Law, Ordinances, Permits, Contract Documents.
  - 2. As defined by limit of work line on Site Plan.
  - 3. As designated by Owner for location of office and storage of material areas.
- B. Do not unreasonably encumber site with materials or equipment.
- C. Do not load structure with weight that will endanger structure
- D. Assume full responsibility for protection and safekeeping of products stored on premises
- E. Obtain and pay for use of additional storage or work areas needed for operations

#### 1.6 WORK UNDER OTHER CONTRACTS

- A. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

#### SUMMARY OF WORK

MAINE DEPARTMENT OF TRANSPORTATION  
KITTERY SCALE - SOUTHBOUND  
KITTERY, MAINE

01100-2

## 1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

## 1.8 DRAWINGS FURNISHED

- A. On the award of the contract, Owner will issue to the Contractor 6 sets of the "Contract Drawings and Specifications" for use in his office and on the job. The owner will also furnish such additional copies as may be required for submission to public authorities to accompany applications for permits
- B. Additional copies of drawings and specifications will be issued at cost of reproduction.
- C. It is the intention that these specifications and the drawings accompanying same shall provide for this Project to be completed in all its respective parts. Any work shown on the drawings and not particularly described in the specifications, or vice versa, shall be furnished by the Contractor as part of his contract.

## 1.9 EXAMINATION OF THE SITE

- A. All Contractors' submitting proposals for the work shall first examine the site and all conditions thereon. All proposals shall take into consideration all such conditions as may affect the work under this contract.

## 1.10 CONTRACTORS DUTIES

### SUMMARY OF WORK

- A. Asbestos-Free Materials: Contractor shall provide certification that all materials used for construction under this contract are 100% asbestos-free. Refer to Section 01340 – Shop Drawings, Product Data and Samples for submittals.
- B. Except as specifically noted, provide and pay for:
  - 1. Labor, materials and equipment.
  - 2. Tools, construction equipment and machinery
  - 3. Water, heat and utilities required for construction
  - 4. Other facilities and services necessary for proper execution and completion of work
- C. Secure and pay for all permits, government fees, and licenses that are applicable at the time of bid for proper execution and completion of the work
- D. Promptly submit written notice to the Engineer of observed variance of Contract Documents from legal requirements.
  - 1. Appropriate Modifications to Contract Documents will adjust necessary changes to comply with Codes and Regulations.
  - 2. Assume responsibility for work known to be contrary to such requirements without notice
- E. Enforce strict discipline and good order among employees. Do not employ unfit persons not skilled in assigned task.
- F. Contractor's employees shall not transport, drink, or have in their possession on the job site any intoxicating beverage. Possession of any controlled substances without a physician's prescription is also prohibited. Any Contractor's employee appearing to be under the influence of an intoxicating beverage or narcotics will be escorted off the property and turned over to a competent escort as determined by the Engineer's Representative. Any vehicle found to contain controlled substances or controlled substance residue will be reported to the State Police for investigation.
- G. Use or possession of firearms, ammunition and/or explosives is prohibited. Where explosives are required due to construction requirements, specific handling requirements and approvals are required.
- H. Work Permit or Citizenship: The contractor shall certify, in writing, that all employees of the Contractor and Subcontractor are citizens of the United States.
- I. Motor Vehicles:
  - 1. Vehicles must be locked at all times and parking will be in areas designated by the Facility Representative. Commercial/Contractor-owned vehicles required for direct support of contract work will have vehicle markings. The vehicle marking shall consist of permanent painting, the use of magnetic sign or semi-permanent signs. Cardboard or lesser materials taped to the vehicle will not be acceptable.
  - 2. All employees operating motor vehicles shall have a valid Operator's License. All vehicles shall display a valid state license plate and inspection sticker if required in the state in which the vehicle is registered.

#### SUMMARY OF WORK

J. WEATHER PROTECTION:

1. During the construction period, it is the Contractor's responsibility that the building be under constant protection from the weather. Should there be any weather damage to the building's interior; such damage is to be rectified to the satisfaction of the Engineer without cost to the owner.

K. START DATE:

- L. Shop drawings and submittals may commence upon entering a contract with the Owner. The contractor may start work as soon as the contract is fully executed and all submittals required to start the project are in accordance with the project manual.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. All materials used for construction under this contract shall be 100% asbestos-free

PART 3 - NOT USED

END OF SECTION 01100



## SECTION 01230 - ALTERNATES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.

#### 1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

#### 1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.

- D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

## **PART 2 - PRODUCTS (Not Used)**

## **PART 3 - EXECUTION**

### **3.1 SCHEDULE OF ALTERNATES**

- A. Alternate No. 1: Demolition of the existing 850 sq. ft wood framed structure and related site work in accordance with section 02221 Selective Demolition.
- B. Alternate No. 2: the addition of the roof dormers over the front and rear entrances and garage door as shown on drawings A-100 and S-101.

**END OF SECTION 01230**

## SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

#### 1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Allied Engineering, Inc. will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
1. Proposal Requests issued by Allied Engineering, Inc. are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  2. Within the time specified in the Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Allied Engineering, Inc.

## CONTRACT MODIFICATION PROCEDURES



1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: For Change Order proposals, use standard forms and number the Request For Proposals (RFP) in alpha numerical order that they are submitted. (RFP#xx).

#### 1.4 CHANGE ORDER PROCEDURES

- A. Maine Department of transportation will issue a Change Order for signatures of Owner and Contractor on the MDOT required form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01250

#### CONTRACT MODIFICATION PROCEDURES

MAINE DEPARTMENT OF TRANSPORTATION  
KITTERY SCALE - SOUTHBOUND  
KITTERY, MAINE

01250-2

## SECTION 01290 – PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
  - 1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 2. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

#### 1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

#### 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Within 10 days after signing the contract, the Contractor shall submit a Schedule of Value breakdown to the Engineer itemized by the individual specification sections, including a separate line item for the Contractor's General Conditions. The breakdown shall appear in his monthly requisition and in accordance with Article 31 of the General Conditions.
  - 2. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

#### PAYMENT PROCEDURES

- a. Requisition for Payment forms with Continuation Sheets shown in the project manual shall be used.
    - b. Submittals Schedule.
  3. Submit the Schedule of Values to Engineer at earliest possible date but no later than 15 days before the date scheduled for submittal of initial Applications for Payment.
  4. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of Engineer.
    - c. Engineer's project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
    - a. Related Specification Section or Division.
    - b. Description of the Work.
    - c. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Change Orders (numbers) that affect value.
    - g. Dollar value.
      - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
  3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
  4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
  6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

#### PAYMENT PROCEDURES

7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

#### 1.5 APPLICATIONS FOR PAYMENT

- A. Application for Payment shall be submitted monthly to the Engineer in accordance with the General Conditions. The Engineer will evaluate individual and total requests; and if he concurs, he will forward to the Owner for payment as stated in the above General Conditions.
- B. Each Application for Payment shall be consistent with previous applications and payments as certified by Engineer and the owner representative and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- C. Payment Application Times: The date for each progress payment shall be determined on site. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- D. The Contractor shall present Application for Payment based on materials incorporated into the work and labor performed and a reasonable amount of materials delivered to the engineer and the owners representative not less than 5 work days prior to the scheduled monthly requisition meeting. Payments shall be authorized for 95% of the amount stated in the application, provided the Engineer shall be satisfied with the correctness of the amount stated. The engineer may request the contractor adjust the requisition for payment amount to be paid to that which they (the Engineer) shall deem to be just. No more than one payment on the contract shall be made in any one month.
- E. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- F. Payment Application Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in this project manual.
- G. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.

#### PAYMENT PROCEDURES

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- H. Transmittal: Submit 5 signed and original copies of each Application for Payment at the scheduled requisition meeting every month. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- I. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
  2. When an application shows completion of an item, submit final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
    - a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of Values.
  3. Contractor's Construction Schedule (preliminary if not final).
  4. Products list.
  5. Submittals Schedule (preliminary if not final).
  6. List of Contractor's staff assignments.
  7. List of Contractor's principal consultants.
  8. Copies of building permits.
  9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  10. Initial progress report.
  11. Performance and payment bonds.
  12. Data needed to acquire Owner's insurance.

#### PAYMENT PROCEDURES

- K. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum. Included list of items to be completed or corrected.
  2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- L. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  6. AIA Document G707, "Consent of Surety to Final Payment."
  7. Evidence that claims have been settled.
  8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  9. Final, liquidated damages settlement statement.

#### 1.6 RETAINAGE

- A. Five percent of the portion of the contract sum properly allocable to labor, materials and equipment incorporated in the work, and five percent of the contract sum properly allocable to materials and equipment suitable stored at the site or other location agreed upon in writing shall be withheld from progress payments and shall be kept to formal completion of the project without penalty of interest.

#### 1.7 LIQUIDATED DAMAGES

- A. For each calendar day that any work shall remain uncompleted after the date of completion specified in the contract, the amount per day listed below in the Schedule of Liquidated Damages shall be deducted from any money due the Contractor not as a penalty, but as liquidated damages, provided that due account shall be taken of any adjustment of the date of completion granted by Change Order.
1. Schedule of liquidated damages shall be in accordance with the requirement in state of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," revision 2002.

#### PART 2 - PRODUCTS (Not Used)

#### PAYMENT PROCEDURES

MAINE DEPARTMENT OF TRANSPORTATION  
KITTEY SCALE- SOUTHBOUND  
KITTEY, MAINE

01290-5

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01290**

**PAYMENT PROCEDURES**

**MAINE DEPARTMENT OF TRANSPORTATION  
KITTERY SCALE- SOUTHBOUND  
KITTERY, MAINE**

**01290-6**

## SECTION 01310 – PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures.
  - 2. Conservation.
  - 3. Coordination Drawings.
  - 4. Administrative and supervisory personnel.
  - 5. Project meetings.
- B. The General contractor shall be responsible for over all coordination of the project
  - 1. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
  - 2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Division 1 Section 01701 " Contract Closeout Procedures" for coordinating Contract closeout.

#### 1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper



installation, connection, and operation. Coordinate sequence of work to accommodate Owner's occupancy.

- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Coordination of Security: All security coordination shall be through the General contractor. The Contractor shall be expected to keep the owners representative informed of any deviation in the normal work schedule. The owners representative shall be given a minimum of two (2) hours notice when a Contractor is not going to be working on a scheduled day because of inclement weather, lack of material etc.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's Construction Schedule.
  - 2. Preparation of the Schedule of Values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Attendance of the Preconstruction Conference
  - 6. Attendance of Progress meetings.
  - 7. Preinstallation conferences.
  - 8. Project closeout activities.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

#### 1.4 SUBMITTALS

- A. Schedule and coordinate submittals specified in Section 01330 – Submittal Procedures.
- B. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.
- C. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other sections.
- D. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

#### PROJECT MANAGEMENT AND COORDINATION

1. Indicate relationship of components shown on separate Shop Drawings.
  2. Indicate required installation sequences.
  3. Refer to Division 15 Section "Basic Mechanical Materials and Methods" and Division 16 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for mechanical and electrical installations.
- E. Staff Names: Within 5 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

#### 1.5 PRECONSTRUCTION CONFERENCE

- A. The successful low bid Contractor will be required to attend a Pre-construction Conference Meeting at the jobsite. At said meeting, the Contractor shall supply to the Owner and the Engineer, in writing, the name of the Project Foreman and/or Manufacturer's Approved Applicator directing all phases of the installation.

#### 1.6 PROGRESS MEETINGS

- A. The Engineer will schedule and administer monthly construction progress meetings, and called meetings, throughout the progress of the work.
1. The Contractor shall provide a project trailer of sufficient size and with furnishings to accommodate the on site meetings.
- B. The Engineer will preside at meetings, record minutes, and distribute copies after meeting to the owner and the General contractor. The General contractor shall be responsible to provide copies of the minutes to any subcontractors that attend the meetings.
- C. Location of Meetings: Job site.
1. The Preconstruction meeting may be held at the owner's facility in close proximity to the job site.
- D. Attendance: The Contractor, Job Superintendent, Owner, Engineer and the Clerk-of-Works.
- E. Minimum Agenda:
1. Review of work progress.
  2. Field observations, problems and decisions.
  3. Identification of problems, which impede planned progress.
  4. Review of submittals schedule and status of submittals.
  5. Review of off-site fabrication and delivery schedules.

#### PROJECT MANAGEMENT AND COORDINATION

6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Coordination of projected progress.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Other business relating to work.
13. Review of Contractor's Application for Payment.
14. Preinstallation conferences may also be held at the Progress meetings.

#### 1.7 PROJECT CLOSEOUT

- A. Coordinate completion and cleanup of work of separate sections in preparation for substantial completion.
- B. After Owner's occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with Contract Documents to minimize disruption of Owner's activities.
- C. Assemble and coordinate closeout submittals specified.

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

## SECTION 01330 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
  - 1. Standard General Conditions.
  - 2. Supplemental Conditions.
  - 3. Division 1 Section "Operation and Maintenance Data".

#### 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Engineer's responsive action.
- B. Informational Submittals: Written information that does not require Engineer's approval. Submittals may be rejected for not complying with requirements.

#### 1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Engineer for Contractor's use in preparing submittals.
- B. Submittal Requirements: Submittals shall have a separate cover sheet for each Division. Submittals for more than one Division shall not be combined.
  - 1. Apply Contractor's stamp, signed or initialed certifying to review, verification of products, field dimensions and field construction criteria, and coordination of information with requirements of work and Contract Documents.

#### SUBMITTAL PROCEDURES

2. Submittals that do not have an approval stamp and signature in compliance with this Section shall be returned without review by the Engineer. The Contractor shall be fully responsible for any delays due to returned shop drawings, product data sheets.
3. Do not fabricate products or begin work or which requires submittals until return of submittals with Engineer's review. All work shall be in conformity with reviewed shop drawings
4. When shop drawings and/or submitted data sheets do not meet the product/materials shown or specified, the Engineer will review submissions no more than two (2) times. After the second review the Contractor shall have the cost to review all subsequent submissions reimbursed to the Owner at the Engineer's published standard billing rate for personnel involved. Cost shall be deducted from the Contract via a Change Order.

C. Standards:

1. Materials: Any material specified by reference to the number, symbol, or title of a specified standard such as Commercial Standard, a Federal Specification, a trade association standard, or other similar standard, shall comply with the requirements in the latest revision thereof, and any amendment or supplement thereto, in effect on the date of invitation for proposals, except as limited to type, class of grade, or modified in such reference, and except as otherwise indicated.
2. Standards: The Standard referred to, except as modified in the specifications, shall have full force and effect as though printed in these specifications. These standards are not furnished to bidders for the reason that the manufacturer's and trades involved are assumed to be familiar with their requirements. The Engineer will furnish, upon request, information as to how copies of the standards referred to may be obtained.
3. Serial Numbers: Where A.S.T.M. Serial Numbers are used, they refer to the latest tentative specifications; standard specifications; standard method or standard method of testing, issued by the American Society for Testing and Materials.

D. Certificate of Conformance: Except where tests and/or inspections in connection with structural materials are specified or required by applicable laws, rules and regulations, manufacturer's certificates covering conformance with the requirements of the above mentioned Federal Specifications and Commercial Standards may be accepted in lieu of such tests. Such certificates shall be furnished to the Engineer for all items so specified.

1. Submit to the Engineer manufacturer's certificates covering conformance with the requirements of asbestos-free materials on all materials.

E. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Contractor shall be fully responsible for observing the need for and making any changes in the arrangement of piping, connections, wiring, manner of installing and the like which may be required by the equipment he proposes to supply. If the drawings show variations from contract drawings or specifications whether because of standard shop practice or other reasons, the Contractor will not be relieved of the responsibility for completing the

# SUBMITTAL PROCEDURES

work in full accordance with the Contract Documents even though such shop drawings are approved by the Engineer.

- a. Shop drawings, product data sheets that do not have an approval stamp and signature in compliance with this Section shall be returned without review by the Engineer. The Contractor shall be fully responsible for any delays due to returned shop drawings, product data sheets.
3. Within 30 days after the date of the Letter of Intent and before any material or equipment is purchased, the Contractor shall submit to the Engineer manufacturer's data, catalog cuts, samples, or other information as required by individual Specification Sections.
    - a. Deviations from the contract, deemed necessary, will only be considered when accompanied by a letter (identifying the item specified, the item proposed, and any cost variation) outlining specific reasons for requesting such deviation. If these conditions are not met, the submittal shall be returned to the Contractor for corrective action. The adequacy and accuracy of submittals and their compliance with contract documents are the responsibility of the Contractor. All approval actions taken by the Engineer will in no way relieve the Contractor of his quality control requirements.
- F. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal.
1. Initial Review: Allow 15 days for initial review of each submittal. Delete subparagraph below if not required.
  2. If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Allow 15 days for processing each resubmittal.
  4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- G. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
  3. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name and address of Engineer.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address of supplier.
    - g. Name of manufacturer.
    - h. Unique identifier, including revision number.
    - i. Number and title of appropriate Specification Section.
    - j. Drawing number and detail references, as appropriate.
    - k. Other necessary identification.

#### SUBMITTAL PROCEDURES

- H. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- I. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Submit six (6) copies of Shop Drawings, Product Data and Manufacturer's Instructions to the Engineer.
  2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- J. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will discard submittals received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
  2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
  3. Transmittal Form: Provide locations on form for the following information:
    - a. Project name.
    - b. Date.
    - c. Destination (To:).
    - d. Source (From:).
    - e. Names of subcontractor, manufacturer, and supplier.
    - f. Category and type of submittal.
    - g. Submittal purpose and description.
    - h. Submittal and transmittal distribution record.
    - i. Remarks.
    - j. Signature of transmitter.
- K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- L. Use for Construction: Use only final submittals with mark indicating action taken by Engineer in connection with construction.

## PART 2 - PRODUCTS

### 2.1 ACTION SUBMITTALS

#### SUBMITTAL PROCEDURES

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. Within 30 days after the date of the Letter of Intent and before any material or equipment is purchased, the Contractor shall submit to the Engineer manufacturer's data, catalog cuts, samples, or other information as required for the items listed in each section.
  - a. Deviations from the contract, deemed necessary, will only be considered when accompanied by a letter (identifying the item specified, the item proposed, and any cost variation) outlining specific reasons for requesting such deviation. If these conditions are not met, the submittal shall be returned to the Contractor for corrective action. The adequacy and accuracy of submittals and their compliance with contract documents are the responsibility of the Contractor. All approval actions taken by the Engineer will in no way relieve the Contractor of his quality control requirements.
2. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
3. Mark each copy of each submittal to show which products and options are applicable.
4. Include the following information, as applicable:
  - a. Manufacturer's written recommendations.
  - b. Manufacturer's product specifications.
  - c. Manufacturer's installation instructions.
  - d. Manufacturer's catalog cuts.
  - e. Wiring diagrams showing factory-installed wiring.
  - f. Printed performance curves.
  - g. Operational range diagrams.
  - h. Standard product operating and maintenance manuals.
  - i. Compliance with recognized trade association standards.
  - j. Compliance with recognized testing agency standards.
  - k. Application of testing agency labels and seals.
  - l. Notation of coordination requirements.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Include the following information, as applicable:
  - a. Shop drawings shall be drawn to scale, shall show all necessary working dimensions and such details, sections, plans and elevations (all properly cross-referenced to the contract drawings) as are necessary to clearly delineate arrangements, construction and connection with other work. They shall be numbered consecutively and dated and shall indicate the project name, the names of the Contractor and the Subcontractor, the name and description of the equipment or articles shown, the manufacturer's name, the kinds, types, grades, thicknesses and finishes of materials, including all fittings, fastenings and the like and the locations at which materials or equipment are to be installed in the work. Marked-up copies of standard drawings showing typical conditions and details and

SUBMITTAL PROCEDURES



indicating their specific application to the work will not be acceptable. Shop drawings shall be accompanied by a letter of transmittal identifying the items of work submitted. Shop drawings shall be submitted in such time as to cause no delay in the orderly progress of work, under the contract, due allowance being made for checking and such correcting, resubmission, and rechecking as may be necessary. The approval of the shop drawings will be general and shall not relieve the Contractor from sole responsibility for errors or omissions of any sort, nor for proper fitting and construction on work or the finishing of materials or work required by the contract documents but not shown or indicated on the shop drawings. Approval will not imply verification of required quantity of material, nor correctness of dimensions. Requests by the Engineer for changes and corrections on shop drawings shall not be construed as an order for extra work under the contract.

- b. Present shop drawings in a clear and thorough manner. Title each drawing with project name and number. Identify each element of drawings by reference to sheet number and detail, schedule or room number of contract documents.
  - c. Dimensions.
  - d. Identification of field dimensions, show relation to adjacent or critical features or work or products.
  - e. Identification of products.
  - f. Fabrication and installation drawings.
  - g. Roughing-in and setting diagrams.
  - h. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
  - i. Shopwork manufacturing instructions.
  - j. Templates and patterns.
  - k. Schedules.
  - l. Design calculations.
  - m. Compliance with specified standards.
  - n. Notation of coordination requirements.
  - o. Notation of dimensions established by field measurement.
- 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  - 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
  - 4. Number of Copies: Submit one correctable, translucent, reproducible print and one blue- or black-line print of each submittal. The Engineer will return the reproducible print.

C. Samples: Prepare physical units of materials or products, including the following:

- 1. Samples properly identified and described, shall be submitted in the number specifically called for in the body of the specification or as may be required by the Engineer. They shall be submitted and resubmitted until approved. No approval of a sample shall be taken in itself to change or modify any contract requirement. Finishes, materials or workmanship in the completed buildings shall match the approved samples.
- 2. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
- 3. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

SUBMITTAL PROCEDURES

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ENGINEER'S [AND CONSTRUCTION MANAGER'S] ACTION

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
  - 1. **REVIEWED, REVIEWED W/NOTES – No Resubmission,**  
**REVIEWED W/NOTES – Resubmission Required, and NOT ACCEPTABLE**
- C. Informational Submittals: Engineer will review each submittal and will not return it, or will reject and return it if it does not comply with requirements.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION

## SUBMITTAL PROCEDURES



## SECTION 01400 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
  - 1. Division 1 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
  - 2. Divisions 2 through 16 Sections for specific test and inspection requirements.

#### 1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

## QUALITY REQUIREMENTS

- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- D. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

#### 1.4 REGULATORY REQUIREMENTS

#### 1.5 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
  - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
  - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
  - 2. Notify testing agencies at least 36 hours in advance of time when Work that requires testing or inspecting will be performed.
  - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

#### QUALITY REQUIREMENTS

- C. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- D. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- E. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  - 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  - 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
  - 5. Do not perform any duties of Contractor.
- F. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field-curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### QUALITY REQUIREMENTS

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### 3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
  - 2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400

### QUALITY REQUIREMENTS

MAINE DEPARTMENT OF TRANSPORTATION  
KITTERY SCALE - SOUTHBOUND  
KITTERY, MAINE

01400-4

## SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities include, but are not limited to, the following:
  - 1. Water service and distribution.
  - 2. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
  - 3. Heating and cooling facilities.
  - 4. Electric power service.
  - 5. Lighting.
  - 6. Telephone service.
- C. Support facilities include, but are not limited to, the following:
  - 1. Temporary roads and paving.
  - 2. Dewatering facilities and drains.
  - 3. Field offices.
  - 4. Storage and fabrication sheds.
- D. Related Sections include the following:
  - 1. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
  - 2. Division 1 Section "Execution Requirements" for progress cleaning requirements.
  - 3. Divisions 2 through 16 for temporary heat, ventilation, and humidity requirements for products in those Sections.

#### TEMPORARY FACILITIES AND CONTROLS



### 1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Engineer, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

### 1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Engineer and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
  - 1. Owner's construction forces.
  - 2. Occupants of Project.
  - 3. Engineer
  - 4. Architect.
  - 5. Testing agencies.
  - 6. Personnel of authorities having jurisdiction.
- B. Water Service: Use water from Owner's existing water system without metering and without payment of use charges.
- C. Electric Power Service: Pay electric power service use charges, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site.
- D. Telephone/Fax Machine: Pay service charges (except tolls calls) for a telephone/fax machine for all entities engaged in construction activities at Project site.
  - a. Pay for a separate dedicated telephone line and telephone for the Engineer and his representative's use.
  - b. Toll calls shall be paid for by the party making the call.
  - c. Coin operated telephones are not acceptable.
- E. Temporary Heat: Pay labor and fuel charges for temporary heat for all entities engaged in construction activities at Project Site.

### 1.5 PROJECT CONDITIONS

- A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
  - 1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

#### TEMPORARY FACILITIES AND CONTROLS

- B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.
2. Relocate temporary services and facilities as required by progress of the Work.

## PART 2 - PRODUCTS not used

### 2.1 EQUIPMENT

- A. General: Provide equipment suitable for use intended.
- B. Field Offices: Prefabricated, Mobile units, or Job-built construction with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading. Provide the following for job-built construction:
1. Exposed Lumber and Plywood: Paint with exterior-grade, acrylic-latex emulsion over exterior primer.
  2. Interior Walls: Paint with two coats of interior latex-flat wall paint.
  3. Roofs: Asphalt shingles or roll roofing.
  4. In addition to the contractors field office provide an office of at least 150 square feet for the owners representative. This may also be used for monthly meetings.
- C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- E. Drinking-Water Fixtures: Drinking-water fountains, [ontainerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
- F. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.
- G. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

#### TEMPORARY FACILITIES AND CONTROLS

- H. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
  - 2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
  - 3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.
- B. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
  - 1. Provide rubber hoses as necessary to serve Project site.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
  - 1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
  - 2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
  - 3. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
- D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from

#### TEMPORARY FACILITIES AND CONTROLS

adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 deg F (10 deg C) in permanently enclosed portions of building for normal construction activities, and 65 deg F (18.3 deg C) for finishing activities and areas where finished Work has been installed.
2. Cold weather protection is required when the average nighttime temperatures fall below 40 degrees F. It shall be considered necessary during the period of rough construction and up to the time when the work is entirely closed in and the heating apparatus is in permanent position, ready for operation on a temporary basis by the Contractor. This work shall include protection of work exposed to the elements, against adverse dampness and cold, by covering, enclosing, heating materials and work under construction, and providing suitable working conditions for all trades employed on the work. This cold weather protection shall be provided by the Contractor at his own expense.
3. Temporary heat shall be considered the period when temporary heating is required from the time the work is entirely closed in and the heating apparatus is in permanent position and ready for operation, until the building and equipment is occupied by the Owner or designated as substantially complete by the Engineer.
4. Temporary heating for protection shall be provided from the permanent heating system when necessary to prevent freezing within the building, to dry out the building and to provide suitable working conditions for the installation and curing of materials. A temperature of not less than 50 degrees F nor more than the maximum design temperatures shall be maintained throughout the entire building.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

F. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.

G. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
2. Provide warning signs at power outlets other than 110 to 120 V.
3. All work shall conform with The National Electric Code.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

#### TEMPORARY FACILITIES AND CONTROLS

2. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.
- I. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office.
1. Provide additional telephone lines for the following:
    - a. Provide a separate telephone line for the Engineer and his Representative.
      - 1) Contractor's fax machine shall be available to the Engineer and his Representative for their use.
  2. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Architect's office.
    - e. Engineers' offices.
    - f. Owner's office.
    - g. Principal subcontractors' field and home offices.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
  2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
  3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- B. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.
- C. Dewatering Facilities and Drains: Comply with requirements in applicable Division 2 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
- D. Common-Use Field Office: Provide an insulated, weathertight, heated/air-conditioned field office for use as a common facility by all personnel including Engineer and his Representative engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 10 persons at Project site. Keep office clean and orderly.

#### TEMPORARY FACILITIES AND CONTROLS

1. Field office shall provide for two separate areas divided by a wall and lockable door. One area for storage of plans, specifications, and shop drawings for the Contractor's use and one area for the Engineer's or his Representative's use. The Engineer's office shall have a floor area of no less than 150 square feet.
  2. Furnish and equip Engineer's offices as follows:
    - a. Desk and three chairs, four-drawer file cabinet, 30" x 72" a plan table, a plan rack, and bookcase.
    - b. Not less than two duplex convenience power outlets.
    - c. Steps for each door (one exterior door for each area) and outside light above each door.
    - d. Separate telephone line.
    - e. Furnish room with conference table, 8 folding chairs
  3. Provide resilient floor covering and painted gypsum wallboard walls and acoustical ceiling. Provide operable windows with adjustable blinds and insect screens.
  4. Provide an electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F (20 deg C). Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 deg F (23 deg C).
  5. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot (4-m) intervals, 1 per wall in each room.
- E. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
1. Location of storage sheds shall be approved by the Owner.
  2. All materials paid for by the Owner shall be under secure lock and key when site is unsupervised. Should a loss occur, such loss will be the Contractor's responsibility.
- F. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.
- G. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- H. Temporary Pumping: Provide all necessary labor and equipment to keep all portions of the excavation free from water and shall maintain pumps in operation as may be required. This will include a wellpoint system if required by the work.
- I. Exposed Excavation: Provide fences, barricades, lights and other similar items around exposed excavations until such excavations have been completely filled.
- J. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may

#### TEMPORARY FACILITIES AND CONTROLS

have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

END OF SECTION 01500

#### TEMPORARY FACILITIES AND CONTROLS

MAINE DEPARTMENT OF TRANSPORTATION  
KITTERY SCALE - SOUTHBOUND  
KITTERY, MAINE

01500-8

## SECTION 01770 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
1. Inspection procedures.
  2. Project Record Documents.
  3. Operation and maintenance manuals.
  4. Warranties.
  5. Instruction of Owner's personnel.
  6. Final cleaning.
  7. Evidence of payment and release of liens
  8. Consent of Surety to final payment
  9. Certificates of Insurance for products and completed operations
- B. Related Sections include the following:
1. Supplementary Conditions for Certificates of Insurance for Products and Completed Operations.
  2. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
  3. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

#### 1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  2. Advise Owner of pending insurance changeover requirements.

#### CLOSEOUT PROCEDURES



3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  5. Prepare and submit Project Record Documents, operation and maintenance manuals.
  6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  8. Complete startup testing of systems.
  9. Submit test/adjust/balance records.
  10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  11. Advise Owner of changeover in heat and other utilities.
  12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  13. Complete final cleaning requirements, including touchup painting.
  14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for Final Completion.

#### 1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
  2. Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report and warranty.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

#### CLOSEOUT PROCEDURES

- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order,
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
  - a. Project name.
  - b. Date.
  - c. Name of Engineer.
  - d. Name of Contractor.
  - e. Page number.

#### 1.6 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Engineer's reference during normal working hours.

- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
  - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
  - b. Accurately record information in an understandable drawing technique.
  - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
  - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

#### CLOSEOUT PROCEDURES

2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
  3. Mark important additional information that was either shown schematically or omitted from original Drawings.
  4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
  5. Identify and date each Record Drawing; include the designation "AS-BUILT DRAWINGS" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, Record Drawings, where applicable.
- D. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

## 1.7 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data:
    - a. Emergency instructions and procedures.
    - b. System, subsystem, and equipment descriptions, including operating standards.
    - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
    - d. Description of controls and sequence of operations.
    - e. Piping diagrams.
  2. Maintenance Data:
    - a. Manufacturer's information, including list of spare parts.
    - b. Name, address, and telephone number of Installer or supplier.
    - c. Maintenance procedures.
    - d. Maintenance and service schedules for preventive and routine maintenance.
    - e. Maintenance record forms.
    - f. Sources of spare parts and maintenance materials.

### CLOSEOUT PROCEDURES

- g. Copies of maintenance service agreements.
  - h. Copies of warranties and bonds.
- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

## 1.8 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- a. For items of work when acceptance is delayed beyond Date of Substantial Completion, submit within ten (10) days after acceptance, listing the date of acceptance as the beginning of the warranty period.
- B. Partial Occupancy: Submit properly executed warranties within 10 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

#### CLOSEOUT PROCEDURES

## PART 3 - EXECUTION

### 3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
1. Provide instructors experienced in operation and maintenance procedures.
  2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
  3. Schedule training with Owner with at least seven days' advance notice.
  4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
1. System design and operational philosophy.
  2. Review of documentation.
  3. Operations.
  4. Adjustments.
  5. Troubleshooting.
  6. Maintenance.
  7. Repair.

### 3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

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- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
  - e. Remove snow and ice to provide safe access to building.
  - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  - h. Sweep concrete floors broom clean in unoccupied spaces.
  - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
  - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - k. Remove labels that are not permanent.
  - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
  - m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - n. Replace parts subject to unusual operating conditions.
  - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
  - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

#### CLOSEOUT PROCEDURES

END OF SECTION 01770

CLOSEOUT PROCEDURES

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## SECTION 01782 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems and equipment.
- B. Related Sections include the following:
  - 1. Division 1 Section "Summary of Multiple Contracts" for coordinating operation and maintenance manuals covering the Work of multiple contracts.
  - 2. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 3. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
  - 4. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
  - 5. Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for products in those Sections.

#### 1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.



## 1.4 SUBMITTALS

- A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return [copy] of draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit 1 copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

## 1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

## PART 2 - PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with the same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

### 2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name, address, and telephone number of Contractor.
  6. Name and address of Architect.
  7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (115-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

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4. Supplementary Text: Prepared on 8-1/2-by-11-inch (115-by-280-mm), 20-lb/sq. ft. (75-g/sq. m) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
  1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

## 2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

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1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.5 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

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- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in the manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard printed maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.

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- D. **Maintenance Procedures:** Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training videotape, if available.
- E. **Maintenance and Service Schedules:** Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. **Scheduled Maintenance and Service:** Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. **Maintenance and Service Record:** Include manufacturers' forms for recording maintenance.
- F. **Spare Parts List and Source Information:** Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. **Maintenance Service Contracts:** Include copies of maintenance agreements with name and telephone number of service agent.
- H. **Warranties and Bonds:** Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

- A. **Operation and Maintenance Documentation Directory:** Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. **Emergency Manual:** Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. **Product Maintenance Manual:** Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. **Operation and Maintenance Manuals:** Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

#### OPERATION AND MAINTENANCE DATA

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
1. Do not use original Project Record Documents as part of operation and maintenance manuals.
  2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."
- G. Comply with Division 1 Section "Closeout Procedures" for the schedule for submitting operation and maintenance documentation.

END OF SECTION 01782

## SECTION 02221 - BUILDING DEMOLITION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. Work under this section shall be completed as an alternate to the contract if accepted by the owner.
- B. This Section includes the following:
  - 1. Demolition and removal of buildings and structures.
  - 2. Demolition and removal of site improvements adjacent to a building or structure to be demolished.
  - 3. Abandoning in place below-grade construction.
  - 4. Disconnecting, capping or sealing, and abandoning in place and or removing site utilities.
- C. Related Sections include the following:
  - 1. Division 1 Section "Summary" for use of the premises and phasing requirements.
  - 2. Division 1 Section "Alternates" for administrative and procedural requirements for alternates.
  - 3. Division 1 Section "Temporary Facilities and Controls" for temporary construction, protection facilities, and environmental-protection measures for building demolition operations.
  - 4. Division 2 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of building demolition.
  - 5. Division 15 Sections for demolishing or relocating site mechanical items.
  - 6. Division 16 Sections for demolishing or relocating site electrical items.

#### 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.



- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

#### 1.4 MATERIALS OWNERSHIP

- A. Title to Materials: Title to all materials and equipment to be removed, except as specified otherwise, is vested in the Contractor upon receipt of contract. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

#### 1.5 SUBMITTALS

- A. Proposed Environmental-Protection Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- B. Schedule of Building Demolition Activities: Indicate the following:
  - 1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
  - 2. Interruption of utility services.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Locations of temporary protection and means of egress.
  - 5. Coordination of Owner's continuing occupancy of adjacent buildings.
- C. Pre-demolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by building demolition operations. Submit before Work begins.
- D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

#### 1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.

- D. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to building demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be demolished.
  2. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  3. Review and finalize protection requirements.

#### 1.7 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of Work.
- B. Owner will occupy another building immediately adjacent to demolition area. Conduct building demolition so Owner's operations will not be disrupted.
1. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
  2. Maintain access to existing walkways, exits, and other adjacent occupied or used facilities.
    - a. Do not close or obstruct walkways, exits, or entrance drive without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for buildings and structures to be demolished.
1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: An asbestos Renovation impact survey was conducted to determine if any asbestos containing building materials are present prior to the demolition of this facility.
1. The following materials were tested for asbestos content
    - a. 2' x 4' ceiling tile NAD
    - b. Joint compound on walls and ceilings NAD
    - c. Gypsum wall board on walls and ceilings NAD
    - d. 12" x 12" floor tile NAD
    - e. Floor tile adhesive 2.5% Chrysotile Asbestos
    - f. Roof shingles NAD
    - g. 15# roof felts NAD

NAD = No Asbestos Detected.

2. In accordance with Maine Department of environmental Protection Chapter 425 Asbestos Management regulations Latest addition.
  - a. Paragraph 2. (E) Activities not subject to this rule: The following activities are not subject to this rule "The removal of asphaltic or petroleum based asbestos-containing roofing materials, mastics, glues, cements, sealants, coatings, and

adhesives provided they are not sanded, grinded, abraded, or cut with a mechanical roof cutter”.

- 1) Note the disposal of non friable asbestos- containing materials, including floor tiles, is governed by 06-096 CMR Chapter 401 “landfilling, siting Design and Operation” of the Solid Waste Management Regulations ( as amended September 6, 1999.
  - b. Paragraph 7.B (3) Demolition by large equipment of buildings containing intact flooring materials. May apply
  3. The contractor shall follow OSHA and NESHAP regulations pertaining with the demolition and or removal of asbestos-containing materials.
- E. Storage or sale of removed items or materials on-site is not permitted.

#### 1.8 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

### PART 2 - PRODUCTS[ (Not Used)]

#### 2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Division 2 Section "Site Clearing and grubbing."

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of building demolition required.
- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are the same as those indicated in Project Record Documents.
- C. Inventory and record the condition of items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to Architect.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

### 3.2 PREPARATION

- A. Refrigerant: Remove and store refrigerant according to 40 CFR 82 and regulations of authorities having jurisdiction.
- B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
  - 1. Utilities will be rerouted and or disconnected during the construction of the new facility. Remove all abandoned utilities to the point they were disconnected from after verifying they are disconnected.
- C. Existing Utilities: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

### 3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, and roadways during demolition operations.
- B. Existing Utilities: Maintain utility services serving adjacent occupied or operating facilities and protect them against damage during demolition operations.
  - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
  - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
    - a. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 1 Section "Temporary Facilities and Controls."
  - 1. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 2. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 3. Provide protection to ensure safe passage of traffic around building demolition area and occupied portions of adjacent buildings and structures.

### 3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings and structures and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
2. Maintain adequate ventilation when using cutting torches.
3. Locate building demolition equipment and remove debris and materials so as not to impose on access road to adjacent facility and parking area.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

### 3.5 MECHANICAL DEMOLITION

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact or dust generation.

C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, to at least 12 inches below grade.

D. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 10 feet outside of footprint of the demolished structure. Abandon utilities outside this area.

1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Division 2 Section "Earthwork."

### 3.6 EXPLOSIVE DEMOLITION

A. Explosives: Use of explosives is not permitted.

### 3.7 SITE RESTORATION

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Division 2 Section "Earthwork."
- B. Site Grading: Uniformly grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

### 3.8 REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by building demolition operations.
- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- C. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

### 3.9 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

### 3.10 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 02221



## SECTION 02230 - SITE CLEARING AND GRUBBING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Removal of surface debris.
- C. Clear site of plant life and grass.
- D. Removal of trees, shrubs, and other plants.
- E. Remove root system of trees, brush and shrubs.
- F. Removal of paving, curbs, and existing gravel.
- G. Removal of culverts, catch basins, manholes and other drainage features.
- H. Removal of fences, posts, bollards, poles, signs, gates and other minor structures.
- I. Removal and stockpiling of topsoil.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. Section 02250 - Dewatering
- C. Section 02315 - Common Excavation, Embankment and Compaction
- D. Section 02317- Trenching.

#### 1.03 DEFINITIONS

- A. Loam
  - 1. Friable clay loam surface soil found in depth of not less than 4 inches.
  - 2. Satisfactory topsoil is free of subsoil, clay lumps, stones, and other objects over 2 inch in diameter, and without weeds, roots and other objectionable material.

#### 1.04 REGULATORY REQUIREMENTS

- A. Obtain required permits from authorities.
- B. Notify affected utility companies before starting work and comply with their requirements.
- C. Do not close or obstruct roadways without permits.
- D. Conform to applicable code for disposal of debris.
- E. Conform to applicable regulatory procedures when hazardous or contaminated materials are discovered.
- F. Dispose of all demolition and construction debris offsite in accordance with local requirements.



## 1.05 PROJECT CONDITIONS

- A. Conform to applicable regulations relating to environmental requirements, disposal of debris, and use of herbicides.
- B. Coordinate clearing work with utility companies.
- C. Protect utilities to remain from damage.
- D. Protect trees, plants, and other features designated to remain as final landscaping.
- E. Provide protection necessary to prevent damage to existing improvements, trees, or vegetation indicated.
- F. Provide traffic control as required, in accordance with the U.S. Department of Transportation "Manual of Uniform Traffic Control Devices" and Maine Department of Transportation (MDOT) requirements.
- G. Conduct site clearing operations to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Thoroughly clean and/or sweep streets and roadways on a daily basis or more frequently as required by the governing authority
- H. Promptly repair damage to adjacent facilities caused by the clearing and grubbing operations, at no cost to the Owner.
- I. Protect bench marks, survey control points, and existing structures from damage or displacement.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Herbicide: Use an approved chemical registered in the State of Maine for stump or basal bark treatment.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Locate and identify utilities to remain.
- B. Verify that existing plants designated to be relocated are tagged or identified.
- C. Identify a waste area for placing removed materials.

### 3.02 PROTECTION

- A. Protect utilities to remain from damage.
- B. Protect existing trees and other vegetation indicated or directed by the Owner to remain in place, against unnecessary cutting, breaking, or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within the drip line, excess foot or vehicular traffic, or parking of vehicles within dripline.
- C. Pollution Controls: Use water sprinkling to limit to the lowest practical level the amount of dust and dirt rising and scattering in the air. Do not use water when it may create hazardous conditions, ice, flooding or pollution.

- D. Clean adjacent structures and improvements of dust, dirt and debris caused by clearing and grubbing or earthwork operations. Return adjacent areas to condition existing prior to the start of the work.

### 3.03 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees, shrubs, and stumps within marked areas and as directed by Owner.
- C. Remove roots to a depth of 18 inches.
- D. Clear undergrowth and deadwood, including blown down or uprooted trees, without disturbing subsoil.
- E. Apply herbicide to remaining stumps to inhibit growth.
- F. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction.
- G. Stumps not required to be removed: Cut flush with ground elevation.
- H. Retain root systems intact in areas where erosion is likely.
- I. Tree wound paint:
  - 1. Apply to all cut surfaces of trees to remain and to all surgically repaired areas damaged by construction.
  - 2. Apply material recommended by the tree wound paint manufacturer for trees which are not readily affected by the standard applications.

### 3.04 REMOVAL

- A. Remove paving, curbs, poles, posts, signs, fences, gates, culvert and minor structures to facilitate construction. Where required by these Drawings, or directed by Owner, preserve those curbs, poles, posts, signs, fences, gates, culverts, minor structures, and other features called for to be reset. Reset removed objects immediately upon completion of backfilling, unless otherwise directed by Owner.
- B. Remove portions of existing pavement; as indicated. Neatly saw cut edges at right angle to surface with a paving saw or compressed air cutter satisfactory to Owner.
- C. Remove debris from site.

### 3.05 GRUBBING

- A. Limits of grubbing: Coincide with limits of clearing.
- B. Use only hand methods for grubbing inside drip line of trees indicated to be left standing.
- C. Remove all stumps, roots over 2 inches in diameter, and matted roots within limit of grubbing to depths of organics or maximum depths shown below:
  - 1. Walks - 18 inches.
  - 2. Roads - 24 inches.
  - 3. Parking Areas - 24 inches.
  - 4. Lawn Areas - 12 inches.

### 3.06 TOPSOIL REMOVAL

- A. Remove vegetation from areas before stripping.

SITE CLEARING AND GRUBBING

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- B. Strip topsoil to whatever depths encountered, avoiding its intermingling with the underlying subsoil or other objectionable material.
- C. Prevent topsoil from mixing with underlying subsoil or other objectionable material.
- D. Stockpiling:
  - 1. Stockpile in areas on site as directed by Owner.
  - 2. Locate out of natural drainageways.
  - 3. Construct to freely drain surface water to a height not to exceed 8 feet with side slopes of 1.5:1 to 2:1.
  - 4. Erect silt fence surrounding stockpile immediately following formation.
  - 5. Cover if required to prevent wind-blown dust.
  - 6. Apply temporary seeding if piles remain for a period of greater than ten days.

### 3.07 DISPOSAL

- A. Burning of Materials: Burning will not be permitted.
- B. Removal: Remove material, debris, rock and extracted plant life from site daily as it accumulates and legally dispose of.
- C. Dumping: Dispose of material in an approved off site legally operated disposal area.
- D. Chipping: Reduce to dimensions of less than 2 inches by use of an approved chipping machine and dispose of at an approved off site, legally operated disposal area.
- E. Trucks removing demolition debris from the site shall be covered or shall be of a closed body design to prevent the accidental throwing upon any way of tacks, nails, wire, scrap metal, glass, crockery, or other substances injurious to the feet of persons or animals or to tires or wheels of vehicles.

### 3.08 RESTORATION

- A. Restore any improvements damaged by or removed by this work to original condition, as acceptable to Owners or other parties or authorities having jurisdiction including but not limited to fences, curbs, signs, trees, shrubs, vegetation, poles, and posts.
- B. Repair or replace trees and vegetation damaged by construction operations, in a manner acceptable to Owner.
- C. Retain qualified tree surgeon to repair specimen tree damage.
- D. Replace trees damaged beyond repair.

END OF SECTION

## SECTION 02250 - DEWATERING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Furnish, operate and maintain dewatering equipment for control, collection, and disposal of ground and surface water entering trenches and excavations.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. Section 02315- Common Excavation, Embankment and Compaction.
- C. Section 02317- Trenching for Site Utilities.
- D. Section 02230 - Site Clearing and Grubbing

#### 1.03 DESIGN REQUIREMENTS

- A. Design dewatering facilities including drains, piping and pumping.

#### 1.04 SUBMITTALS

- A. Prior to start of excavation and trenching, submit dewatering design and methods to Owner for review.

### PART 2 PRODUCTS

#### 2.01 EQUIPMENT

- A. Provide pumps, drains, piping and other facilities necessary to keep excavations and trenches free of water including spare units available for immediate use in the event of equipment failure.

### PART 3 EXECUTION

#### 3.01 PROTECTION

- A. Protect watercourses, sewer systems and adjacent properties from siltation by use of sediment ponds or other measures acceptable to Owner.
- B. Keep excavations clear of groundwater, surface water, seepage, sewage and stormwater.

#### 3.02 INSTALLATION

- A. Install, construct and maintain equipment and facilities required for work of this section.
- B. Dispose of water removed from Work in a suitable manner which will not interfere with other work, cause erosion, damage pavements, other surfaces or property and is acceptable to Owner.
- C. Remove dewatering equipment and facilities when no longer required.
- D. Backfill excavations in accordance with 02315.

E. Repair damage resulting from dewatering operations.

END OF SECTION

## SECTION 02315 - COMMON EXCAVATION, EMBANKMENT AND COMPACTION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Excavation, backfill and compaction for building volume below grade, footings, slabs-on-grade, and utilities within the building.
- B. Excavation, backfill and compaction for areas outside of the building.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. Section 02250 - Dewatering.
- C. Section 02317 - Trenching.

#### 1.03 REFERENCES

- A. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 1996a.
- B. ASTM D 698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 1991.
- C. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)); 1991.
- D. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System); 1998.
- E. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 1996.
- F. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 1996.
- G. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 1998.

#### 1.04 DEFINITIONS

- A. Common excavation: Excavated material meeting the description of MDOT Specification Section 203.01, except common excavation shall include the removal and disposal of boulders, solid mortared stone masonry, and concrete masonry when each is less than 2 cubic yards in volume.

#### 1.05 SUBMITTALS

- A. Samples: 75 lb (34 kg) sample of each type of fill; submit in air-tight containers to testing laboratory.

- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.
- E. Moisture Density Test Reports: Results of ASTM D1557 laboratory tests.

#### 1.06 PROJECT CONDITIONS

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Protect plants, lawns, and other features to remain.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Protect above or below grade utilities which are to remain.
- E. Repair damage.
- F. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- G. Notify Owner of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
- H. Protect excavations and soil adjacent to and beneath foundations from frost.
- I. Grade excavation top perimeter to prevent surface water runoff into excavations.
- J. Protect excavations by shoring, bracing, sheet piling, underpinning or other methods required to prevent cave-in or loose soil from falling into excavation.
- K. Maintenance of existing flows:
  - 1. Keep existing sewers and drains in operation.
  - 2. If existing sewers and drains are disturbed, provide for maintenance of such flows until work is completed.
  - 3. Do not allow raw sewage to flow on ground surface or stand in excavation.
- L. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.
- M. When fill materials need to be stored on site, locate stockpiles where indicated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.

#### PART 2 PRODUCTS

##### 2.01 MATERIALS

- A. Subsoil: Reused, meeting the requirements of Common Borrow.
- B. Common Borrow: MDOT 703.18; Earth, suitable for embankment construction, free from frozen material, perishable rubbish, peat, organics and other unsuitable material, with sufficient moisture content to provide the required compaction and stable embankment, moisture content shall not exceed 4 percent above optimum. Determine optimum moisture content in accordance

with ASTM D698 (Cohesive Soils) or D1557 (Granular Soils).

- C. Granular Borrow: MDOT 703.19; Mixture of sand, gravel and silt or reclaimed asphalt, concrete, brick, crushed rock that is crushed and blended with sand, free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that portion passing a 3 inch sieve shall meet the following requirements:
  - 1. No. 40 sieve: 0 to 70 percent passing by weight.
  - 2. No. 200 sieve: 0 to 20 percent passing by weight.
  - 3. Granular borrow shall contain no particles or fragments with a maximum dimension in excess of one-half of the compacted thickness of the layer being placed. Granular borrow shall not contain particles of rock which will not pass the 6 inch square mesh sieve.
- D. Aggregate Base: MDOT 703.06 Type 'A' Crushed Gravel, of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that part that passes a 3 inch sieve shall meet the following requirements:
  - 1. 1/2 inch sieve: 45 to 70 percent passing by weight
  - 2. 1/4 inch sieve: 30 to 55 percent passing by weight
  - 3. No. 40 sieve: 0 to 20 percent passing by weight
  - 4. No. 200 sieve: 0 to 5 percent passing by weight
  - 5. Type A aggregate shall not contain particles of rock which will not pass the 2 inch square mesh sieve.
- E. Aggregate Subbase: MDOT 703.06, Type 'D' Gravel, of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that part that passes a 3 inch sieve shall meet the following requirements:
  - 1. 1/4 inch sieve: 25 to 70 percent passing by weight
  - 2. No. 40 sieve: 0 to 30 percent passing by weight
  - 3. No. 200 sieve: 0 to 7 percent passing by weight
  - 4. Type D aggregate shall not contain particles of rock which will not pass the 6 inch square mesh sieve.
- F. Select Fill: Screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that part that passes a 4 inch sieve shall meet the following requirements:
  - 1. 4 inch sieve: 100 percent passing by weight
  - 2. 3 inch sieve: 90 to 100 percent passing by weight
  - 3. 1/4 inch sieve: 25 to 90 percent passing by weight
  - 4. No. 40 sieve: 0 to 30 percent passing by weight
  - 5. No. 200 sieve: 0 to 5 percent passing by weight
- G. Crushed Stone : MDOT 703.22 Underdrain backfill Type 'C' meeting the following requirements:
  - 1. 1 inch sieve: 100 percent passing by weight.
  - 2. 3/4 inch sieve: 90 to 100 percent passing by weight.
  - 3. 3/8 inch sieve: 0 to 75 percent passing by weight.
  - 4. No. 4 sieve: 0 to 25 percent passing by weight.
  - 5. No. 10 sieve: 0 to 5 percent passing by weight.

## 2.02 ACCESSORIES

- A. Water for sprinkling: Fresh and free from oil, acid, and injurious alkali or vegetable matter.
- B. Geotextile Fabric: Non-biodegradable, non-woven, Mirafi 500x.



- C. Calcium chloride: ASTM D98 commercial grade except as waived by Owner.

## 2.03 SOURCE QUALITY CONTROL

- A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- B. If tests indicate materials do not meet specified requirements, change material and retest. Materials failing to meet specified requirements, if used prior to acceptance, shall be removed and replaced at no cost to Owner.
- C. Provide materials of each type from same source throughout the Work.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Examine the areas and conditions under which excavating and filling is to be performed and notify Owner in writing of conditions detrimental to proper and timely completion of work.
- C. Correct unsatisfactory conditions in a manner acceptable to Owner prior to proceeding with work.
- D. Maintain in operating condition existing utilities, active utilities and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.
- E. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- F. Verify structural ability of unsupported walls to support imposed loads by the fill.

### 3.02 INSPECTION

- A. Verify stockpiled fill to be reused is approved.
- B. Verify areas to be backfilled are free of debris, snow, ice or water, and surfaces are not frozen.

### 3.03 PREPARATION

- A. When necessary, compact subgrade surfaces to density requirements for embankment, aggregate base and aggregate subbase materials.
- B. Identify known underground utilities. Stake and flag locations.
- C. Identify and flag surface and aerial utilities.
- D. Notify utility companies of work to be done.
- E. Locate, identify, and protect utilities that remain and protect from damage.
- F. Scarify subgrade surface to a depth of 6 inches (150 mm) to identify soft spots.
- G. Cut out soft areas of subgrade not capable of compaction in place. Backfill with granular borrow or crushed stone.

### 3.04 FOUNDATION PREPARATION

- A. Construct building pad in such a manner as to provide positive drainage of surface water off the pad and to protect the pad surface and subgrade. Temporary ditches shall be constructed to

carry any surface runoff away from the pad area, as directed by the Owner. At the start of building construction, the pad shall be prepared for foundations and temporary ditches properly backfilled.

- B. Topsoil and pavement shall be removed from proposed building area. The exposed substrate shall be proofrolled with a 10 ton vibratory roller compactor. Any areas that yield after 3-5 passes of the compaction equipment shall be over-excavated and replaced with compacted granular borrow in dry, non-freezing conditions and select fill in other conditions.
- C. Borrow for use beneath the building shall meet the requirements of granular borrow.
- D. Should foundation subgrades become loose, soft or difficult to work, the unsuitable soils shall be removed and replaced with additional granular borrow if above the groundwater table in the event of dry, non-freezing conditions or select fill in other conditions, or crushed stone if below the groundwater table and underlain by geotechnical fabric.
- E. Excavations below foundations to provide the 6" working mat and/or to remove unsuitable soils shall continue laterally, from the footing edges, a distance equal to the depth of the excavation below the bottom of the footing (1H/1V).
- F. All footings shall be underlain by a 6-inch (min) thick mat of select fill.
- G. All slab-on-grades shall be underlain by 9 inches (min) of compacted Type "A" crushed gravel aggregate base.
- H. Soil fill placed adjacent to foundations exposed to freezing temperatures and as backfill around features such as bollards and light pole bases shall be select fill.
- I. Soil fill placed adjacent to foundations not exposed to freezing temperatures shall be granular borrow.
- J. Place all fill in horizontal lifts and compact such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thickness for soil fills shall not exceed 12 inches.
- K. Sub-slab fill shall be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557.
- L. Exterior foundation backfill shall be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557 beneath paved areas. All other areas shall be compacted to at least 90 percent of its maximum of its maximum dry density as determined by ASTM D-1557.
- M. Crushed stone shall be compacted to 100 percent of its dry rodded unit weight as determined by ASTM C-29.
- N. An exterior perimeter foundation drainage system using rigid 4" diameter SDR-35 pipe shall be provided with 6 inches of crushed stone wrapped in geotextile fabric. Set the foundation drain adjacent to the footing, above the 6" working mat.
- O. Exterior foundation backfill shall be sealed with a surficial layer of clayey or loamy soil in areas that are not paved or occupied by entrance slabs.

### 3.05 EXCAVATING

- A. Underpin adjacent structures which may be damaged by excavating work.

- B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Excavate materials encountered when establishing required subgrade elevations in accordance with MDOT Specification Section 203.04 and 203.05.
- D. Remove lumped subsoil, boulders, solid mortared stone masonry, concrete masonry and rock up to 2 cubic yards, measured by volume.
- E. Conform to elevations, contours, dimensions, line and grade shown on the Drawings.
- F. When excavation through roots is necessary, perform work by hand and cut roots with a sharp axe.
- G. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored. All excavations shall be consistent with OSHA regulations.
- H. Do not excavate wet subsoil.
- I. Remove all existing fill soils from beneath foundations.
- J. Do not interfere with 45 degree bearing splay of foundations.
- K. Correct areas that are over-excavated and load-bearing surfaces that are disturbed at no cost to Owner.
- L. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- M. Remove excavated material that is unsuitable for re-use from site.
- N. Surplus Material:
  - 1. Make arrangements to provide suitable disposal areas off-site or at the maintenance lot.
  - 2. Deposit and grade material to the satisfaction of the owner of the property on which the material is deposited, where off-site disposal is required.
  - 3. Obtain any necessary permits for disposal.
  - 4. Provide suitable watertight vehicles to haul soft or wet materials over streets or pavements to prevent deposits on same.
  - 5. Keep crosswalks, streets, and pavements clean and free of debris.
  - 6. Clean up materials dropped from vehicles as often as directed by Owner.

### 3.06 FILLING AND SUBGRADE PREPARATION

- A. Topsoil and pavement shall be removed from proposed fill and pavement areas.
- B. Proofroll subgrades using a 10-ton vibratory roller-compactor, unless otherwise noted. Any areas that continue to yield after 3 to 5 passes of the compaction equipment shall be over-excavated and replaced with clean granular borrow in dry, non-freezing conditions, and select fill in other conditions.
- C. Pavement subgrade shall consist of Granular Borrow compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557.
- D. Landscape subgrade shall consist of common borrow compacted to at least 90% of its maximum dry density as determined by ASTM D-1557.
- E. Place and compact fill materials in continuous layers not exceeding 12 inches loose depth upon compacted material.

- F. Fill to contours and elevations indicated using unfrozen materials.
- G. Fill up to subgrade elevations unless otherwise indicated.
- H. Employ a placement method that does not disturb or damage other work.
- I. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- J. Maintain optimum moisture content of fill materials to attain required compaction density.
- K. Slope grade away from building minimum 2 inches in 10 ft (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- L. Correct areas that are over-excavated.
  - 1. Load-bearing foundation surfaces: Use select fill, flush to required elevation, compacted to 95 percent of maximum dry density.
  - 2. Other areas: Use common borrow, flush to required subgrade elevation, compacted to minimum 95 percent of maximum dry density.
  - 3. Other Areas: Use Granular Borrow, flush to required subgrade elevation, compacted to minimum 95 percent of maximum dry density. Use select fill or crushed stone as necessary to backfill wet areas of overexcavation.
- M. Compaction Density Unless Otherwise Specified or Indicated:
  - 1. Under slabs-on-grade and similar construction: 95 percent of maximum dry density.
  - 2. At other locations: 90 percent of maximum dry density.
- N. Leave stockpile areas completely free of excess fill materials.
- O. Reshape and re-compact fills subjected to vehicular traffic.
- P. Frost:
  - 1. Do not excavate to full indicated depth when freezing temperatures may be expected unless fill material or structures can be constructed immediately after the excavation has been completed. Protect the excavation from frost if placing of fill or structure is delayed.
  - 2. Fill shall not be placed over frozen soil. Soil that is frozen shall be removed prior to placement of compacted fill. Remove all frozen uncompacted soil prior to placing additional fill for compaction.
- Q. Native soils can undergo substantial strength loss when subjected to construction traffic and excavation activities, particularly during periods of precipitation and shallow groundwater levels. Care must be exercised to minimize disturbance of the bearing soils. Should the subgrade become yielding or difficult to work, disturbed areas shall be excavated and backfilled in accordance with Section 3.06
- R. Clean granular soil meeting the select fill gradation shall be provided to a depth of 4.0 feet below the top of entrance slabs and sidewalks in contact with the structure. The thickness of select fill shall extend horizontally from the structure outward to a point at least one foot beyond the width of the slab or sidewalk. The select fill shall have a gradual transition up to the bottom of the adjacent subbase at a 1V to 3H slope or flatter.

### 3.07 CONSTRUCTION OF AGGREGATE BASE AND SUBBASE COURSE

- A. Place and compact aggregate base and subbase course materials in continuous layers not exceeding 12 inches loose depth upon compacted material, unless noted otherwise.

- B. Employ a placement method so not to disturb or damage structures and utilities.
- C. Spread well-mixed materials having no pockets of either fine or coarse material.
- D. Do not segregate large or fine particles.
- E. Compact by mechanical means to obtain 95 percent of maximum dry density as determined in accordance with ASTM D1557. Base course material shall be compacted with a minimum of two passes with self propelled vibratory compaction equipment.
- F. Maintain surface, compaction and stability until pavement course has been placed.
- G. Conform to elevations, contours, dimensions, line and grade shown on the Drawings.

### 3.08 DUST CONTROL

- A. Upon request of Owner, implement the following dust control measures:
  - 1. Apply water and calcium chloride as directed by Owner.
  - 2. Spread calcium chloride uniformly over designated area.
  - 3. Apply water with equipment having a tank with pressure pump and nozzle equipped spray bar acceptable to Owner.

### 3.09 TOLERANCES

- A. Top surface of base and subbase course: Plus or minus 3/8 inch.

### 3.10 FIELD QUALITY CONTROL

- A. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.
- B. Compaction density testing will be performed by the Owner on compacted fill in accordance with ASTM D2922.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor") or ASTM D 1557 ("modified Proctor") as appropriate for soil type.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- E. Frequency of Tests:
  - 1. Building subgrade areas, including 10'-0" outside exterior building lines: In fill areas, not less than one compaction test on each lift for every 2,500 square feet. Proofroll cut areas.
  - 2. Areas of construction exclusive of building subgrade: In fill areas, not less than one compaction test on each lift for every 10,000 square feet. Proofroll cut areas.

### 3.11 PROTECTION

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect newly graded areas from traffic and erosion and keep free of trash and debris.
- D. Repair and re-establish grades in settled, eroded and rutted areas within specified tolerances.
- E. Slope fill surfaces to shed water.

END OF SECTION



## SECTION 02317 - TRENCHING FOR SITE UTILITIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Excavation of trenches for utilities.
- B. Excavation for structures.
- C. Compacted bedding and compacted backfilling over utilities to subgrade elevations.
- D. Compacted base and compacted backfilling for structures to subgrade elevations.
- E. Compaction requirements.
- F. Dust control.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. Section 02510 - Water Distribution.
- C. Section 02535 - Sanitary Sewer Piping.
- D. Section 02560 - Sewage Pump Station.
- E. Section 02635 - Storm Drainage Piping.

#### 1.03 REFERENCES

- A. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 1996a.
- B. ASTM D 698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 1991.
- C. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)); 1991.
- D. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System); 1998.
- E. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 1996.
- F. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 1996.
- G. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 1998.



#### 1.04 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: As Indicated on drawings or the bottom of aggregate subbase gravel in paved areas, the bottom of loam in seeded areas, or to 1 foot below finished floor elevation.

#### 1.05 SUBMITTALS

- A. Samples: 75 lb (34 kg) sample of each type of fill; submit in air-tight containers to testing laboratory.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

#### 1.06 PROJECT CONDITIONS

- A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where designated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.
- C. Verify that survey bench marks and intended elevations for the Work are as indicated.
- D. Protect plants, lawns, and other features to remain.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- F. Protect excavations by shoring, bracing, sheet piling, underpinning or other methods required to prevent cave-in or loose soil from falling into excavation.
- G. Protect above or below grade utilities which are to remain. Repair any damage caused by construction of this project at no cost to Owner.
- H. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases
- I. Protect above or below grade utilities which are to remain.
- J. Grade excavation top perimeter to prevent surface water runoff into excavations
- K. Repair damage.
- L. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- M. Protect excavations and soil adjacent to and beneath foundations from frost.
- N. Grade excavation top perimeter to prevent surface water runoff into excavations.
- O. Maintenance of existing flows:

1. Keep existing sewers and drains in operation.
2. If existing sewers and drains are disturbed, provide for maintenance of such flows until work is completed.
3. Do not allow raw sewage to flow on ground surface or stand in excavation.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Type B Underdrain Sand: MDOT 703.22; Granular material meeting the requirements of MDOT 703.22, Type B Underdrain Backfill, with the following limits:
  1. 1 inch sieve: 95 to 100 percent passing by weight
  2. 1/2 inch sieve: 75 to 100 percent passing by weight
  3. No. 4 sieve: 50 to 100 percent passing by weight
  4. No. 20 sieve: 15 to 80 percent passing by weight
  5. No. 50 sieve: 0 to 15 percent passing by weight
  6. No. 200 sieve: 0 to 5 percent passing by weight
  7. Type B backfill shall not contain particles of rock which will not pass the 1-1/2 inch square mesh sieve.
- B. Type C Underdrain Stone: MDOT 703.22; Crushed material meeting the requirements of MDOT 703.22, Type C Crushed Stone, with the following limits:
  1. 1 inch sieve: 100 percent passing by weight
  2. 3/4 inch sieve: 90 to 100 percent passing by weight
  3. 3/8 inch sieve: 0 to 75 percent passing by weight
  4. No. 4 sieve: 0 to 25 percent passing by weight
  5. No. 10 sieve: 0 to 5 percent passing by weight
- C. Sand Bedding & Backfill ; free of silt, clay, loam, friable or soluble materials, and organic matter.
  1. Graded in accordance with the following limits:
    - a. 3/8 Inch sieve: 100 percent passing by weight
    - b. No. 4 (4.75 mm) sieve: 95 to 100 percent passing.
    - c. No. 200 (75 micro m) sieve: 0 to 5 percent passing by weight.

### 2.02 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, non-woven, Mirafi 500x.
- B. Water for sprinkling: Fresh and free from oil, acid and injurious alkali or vegetable matter.
- C. Calcium Chloride: ASTM D98 commercial grade except as waived by the Owner.

### 2.03 SOURCE QUALITY CONTROL

- A. If tests indicate materials do not meet specified requirements, change material and retest. Materials not meeting specified requirements, if used prior to acceptance, shall be removed and replaced at no cost to Owner.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Examine the areas and conditions under which excavating and filling is to be performed and

notify Owner in writing of conditions detrimental to proper and timely completion of work

- C. Correct unsatisfactory conditions in a manner acceptable to Owner prior to proceeding with work
- D. Maintain in operating condition existing utilities, active utilities and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.
- E. Locate, identify, and protect utilities that remain and protect from damage.
- F. Notify utility company to remove and relocate utilities.

### 3.02 INSPECTION

- A. Verify stockpiled fill to be reused is approved.
- B. Verify areas to be backfilled are free of debris, snow, ice or water, and surfaces are not frozen.

### 3.03 PREPARATION

- A. When necessary, compact subgrade surfaces to density requirements for embankment, aggregate base and aggregate subbase materials.
- B. Identify known underground utilities. Stake and flag locations.
- C. Identify and flag surface and aerial utilities.
- D. Notify utility companies of work to be done.
- E. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type B Underdrain Sand Backfill and compact to density equal to requirements for subsequent backfill material.
- F. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

### 3.04 GENERAL REQUIREMENTS

- A. Refer to Section 02315 Common Excavation, Embankment and Compaction.
- B. Provide trenching and backfilling for water service, sewerage pipes, conduits and structures. Water and sewerage lines separation shall be minimum 10 feet horizontally and 18 inches vertically. Lay all piping in open trench. Maintain access to fire hydrants by fire-fighting equipment.
- C. Sheet and brace trenches and remove water as necessary to fully protect workmen and adjacent facilities, in keeping with local regulations or, in the absence thereof, with the provisions of the "Manual of Accident Prevention in Construction," of the Associated General Contractors of America, Inc. Under no circumstances lay pipe or install appurtenances in water. Keep the trench free from water until pipe joint material has hardened. Sheet piling left in place shall be cut off not less than 2 feet below finished grade. Sheet piling shall not be removed until the trench is substantially backfilled.
- D. It shall be noted that excavation under this contract shall be unclassified.
- E. Grade the bottom of the trenches evenly to insure uniform bearing for full length of all pipes. Excavate all rock, cemented gravel, old masonry, or other hard material to at least 6 inches below the pipe at all points. Refill such space and all other cuts below grade with sand or fine gravel firmly compacted.

#### TRENCHING FOR SITE UTILITIES

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- F. Should soil conditions necessitate special supports for piping and/or appurtenances, including the removal of unsuitable material and refilling with gravel or other material, such work shall be performed as necessary.
- G. Backfill trenches only after piping has been inspected, tested and the locations of pipe and appurtenances have been recorded. Backfill by hand around pipe and for a depth of 1 foot above the pipe. Use earth without rock fragments or large stones and tamps, as specified, in layers not exceeding 6 inches in thickness, taking care not to disturb the pipe or injure the pipe coating. Compact the remainder of the backfill as specified with a rammer of suitable weight, or with an approved mechanical tamper, provided that under pavements, walks and other surfacing, the backfill shall be tamped as specified. Exclude all cinders, rubbish and scrap metal from trenches in which metal pipes are laid.

### 3.05 ELECTRICAL/TELEPHONE

- A. Refer to the Handbook of Standard Requirements for Electric Service and Meter Installation for installation requirements for primary electric service, secondary electric service, telephone service and cable services. Pull ropes shall be installed in all conduits.

### 3.06 TRENCHING

- A. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- B. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored. All excavations shall be consistent with OSHA requirements.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Excavate subsoil required for piping and appurtenances.
- E. Cut trenches wide enough to enable installation and allow inspection of installed utilities.
- F. Hand trim excavations. Remove loose matter.
- G. Remove large stones and other hard matter which could damage piping or impede consistent backfilling or compaction.
- H. Remove excavated material that is unsuitable for re-use from site.
- I. Stockpile excavated material to be re-used in area designated on site. Do not store excavated materials adjacent to excavations where they would surcharge sideslopes.
- J. Correct unauthorized excavation with heavy gravel or as directed by Owner at no cost to Owner.
- K. Fill over-excavated areas under pipe bearing surfaces with Sand Bedding, Type B Underdrain Sand or Type C Underdrain Stone or as directed by Owner
- L. Do not store excavated material adjacent to excavations where they could surcharge sideslopes.
- M. Remove excess excavated material from site.
- N. Surplus Material:
  - 1. Make arrangements to provide suitable disposal areas off-site or at the maintenance lot.
  - 2. Deposit and grade material to the satisfaction of the owner of the property on which the material is deposited, where off-site disposal is required.
  - 3. Obtain any necessary permits for disposal.

#### TRENCHING FOR SITE UTILITIES

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4. Provide suitable watertight vehicles to haul soft or wet materials over streets or pavements to prevent deposits on same.
5. Keep crosswalks, streets, and pavements clean and free of debris.
6. Clean up materials dropped from vehicles as often as directed by Owner.

### 3.07 REPAIRS TO EXISTING PIPES, CONDUIT AND WATER LINES

- A. Remove damaged or broken portions of pipe or conduit and replace with a pipe or conduit of the same size and material, unless otherwise directed by Owner, designed to serve same function as existing pipe or conduit.
- B. Make connections for repair with flexible couplings to satisfaction of Owner.
- C. Maintain inventory of suitable repair materials on site.
- D. Make repairs immediately following discovery of damage.
- E. Do not backfill until repairs have been completed to satisfaction of Owner.
- F. Repairs to water mains and services will be by the water utility. Coordination and payment for repairs shall be the responsibility of the Contractor.

### 3.08 BACKFILLING

- A. Place and compact bedding material to grade of underside of pipe in trench bottom as soon as excavation reaches grade.
- B. Compact bedding material to provide firm laying base.
- C. Underslab utilities shall be installed on sand bedding material and backfilled with sand backfill.
- D. After pipe is laid to grade, place bedding material uniformly on each side of pipe up to spring line while carefully compacting bedding material under haunches of pipe.
- E. Support pipe and conduit during placement and compaction of bedding fill.
- F. Place and compact base material to grade of underside of appurtenant structures in bottom of excavation as soon as excavation reaches grade.
- G. Compact base material for appurtenant structures to provide a firm laying base.
- H. Place and compact backfill materials in continuous layers not exceeding 8" in areas of paving, slabs-on-grade, and similar construction. Lift thickness not to exceed 16" in lawn or field areas.
- I. Backfill to contours and elevations indicated using unfrozen materials.
- J. Install geotextile fabric in accordance with manufacturer's recommendations and where shown on Drawings.
- K. Employ a placement method that does not disturb or damage other work or existing pipe.
- L. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- M. Maintain optimum moisture content of fill materials to attain required compaction density.
- N. Slope grade away from building minimum 2 inches in 10 ft (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- O. Correct areas that are over-excavated.

1. Thrust bearing surfaces: Fill with concrete.
  2. Other areas: Use common borrow in lawn areas or granular borrow in paved/building areas, flush to required elevation, compacted to minimum 95 percent of maximum dry density
- P. Leave stockpile areas completely free of excess fill materials.
- Q. Upon completion of backfilling in paved areas, sweep undisturbed pavement.
- R. Upon request of Owner implement the following dust control measures during the interim period between backfilling and capping of the trench:
1. Apply water and calcium chloride as directed by Owner.
  2. Spread calcium chloride uniformly over designated areas.
  3. Apply water with equipment having a tank with pressure pump and nozzle equipped spray bar acceptable to Owner.
- S. Compaction Density Unless Otherwise Specified or Indicated:
1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density based upon ASTM D-1557.
  2. At other locations: 90 percent of maximum dry density.
- T. Reshape and re-compact fills subjected to vehicular traffic.

### 3.09 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations.

### 3.10 FIELD QUALITY CONTROL

- A. Compaction density testing will be performed by Owner on compacted fill in accordance with ASTM D2922.
- B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor") or ASTM D 1557 ("modified Proctor") as appropriate for soil type.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- D. Frequency of Tests: 1 test for each 200'-0" of trench for the first and every other lift of compacted trench backfill not including pipe bedding.

### 3.11 CLEAN-UP

- A. Leave unused materials in a neat, compact stockpile.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION



## SECTION 02320 - SLOPE PROTECTION AND EROSION CONTROL

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Temporary silt fence.
- B. Erosion Control Mesh.
- C. Hay bales, temporary erosion checks.
- D. Stone check dams.
- E. Wood waste compost/bark filter berm.
- F. Plain riprap - machine placed stones on filter fabric.
- G. Boom supported floating silt fence.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section
- B. Section 02230- Site Clearing and Grubbing.
- C. Section 02315 - Common Excavation, Embankment and Compaction.

#### 1.03 ENVIRONMENTAL REQUIREMENTS

- A. Conform to Maine Department of Environmental Protection publication "Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices".
- B. Maintain erosion control installations in a functional condition at all times. Inspect after each rainfall and at least daily during prolonged rainfall. Immediately correct deficiencies

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Silt Fence: MDOT Section 656.03.
- B. Compost/Bark Berm: As indicated on details.
- C. Erosion Control Mesh: MDOT Section 717.061.
- D. Hay Bales: Baled hay approximately 14" by 18" by 30" securely tied to form a firm bale.
- E. Plain Riprap: MDOT Section 703.26.
- F. Stone check dams: Crushed stone.
- G. Filter Fabric: Mirafi 600x or Approved Equal.



### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means installer accepts existing surface conditions.

#### 3.02 INSTALLATION

- A. Install silt fences before beginning excavation. Use compost/bark berms in place of silt fence only in wooded areas. It is the Contractor's option to use the compost/bark berm provided its use is in accordance with the MDEP Best Management Practices Manual.
- B. Install silt fences in accordance with MDOT 656.08.
- C. Install erosion control mesh in accordance with MDOT 613:
- D. Install hay bales in accordance with MDOT Section 656:
- E. Install plain riprap in accordance with MDOT 610 with the exception that plain riprap shall be installed on filter fabric installed per manufacturer's recommendations:

#### 3.03 MAINTENANCE

- A. Maintain erosion control installations in a functional condition at all times. Inspect after each rainfall and at least daily during prolonged rainfall. Immediately correct deficiencies
- B. Make a daily review of the location of erosion control measures in areas where construction activity causes drainage runoff to ensure that erosion control measures are properly located for effectiveness.
- C. Where deficiencies exist, install additional erosion control measures as approved or directed by the Owner. No additional payment shall be made for additional erosion control measures which may be required.

#### 3.04 TEMPORARY EROSION CONTROL REMOVAL

- A. Remove temporary silt fence and hay bales when no longer needed and dispose of in a proper manner.

END OF SECTION

## SECTION 02510 - WATER DISTRIBUTION

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Pipe and fittings for site domestic water lines.
- B. Valves.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- A. Section 02250 - Dewatering
- B. Section 02317 - Trenching for Site Utilities.

#### 1.03 REFERENCES

- A. ASTM D 3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 1995.
- B. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; American Water Works Association; 1993 (ANSI/AWWA C600).
- C. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; American Water Works Association; 1996 (ANSI/AWWA C901).

#### 1.04 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

#### 1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with Department of Human Services, Division of Health Engineering requirements.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Unload materials so as to avoid shock or damage. Handle and store all pipe in such a manner as to avoid deterioration or other injury thereto. Place no pipe within pipe of larger size. Store pipe and fittings on sills above storm drainage level and delivery for laying after trenches are excavated.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Polyethylene Pipe: ASTM D 3035, for 100 psig (710 kPa) pressure rating:
  - 1. Fittings: AWWA C901, molded or fabricated.
  - 2. Joints: Compression.
- B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service " in large letters.
- C. Gate Valves Up To 3 Inches (75 mm):
  - 1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, and extension box.
- D. Ball Valves Up To 2 Inches (50 mm):
  - 1. Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA inlet end, compression outlet, with control rod, and extension box.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Confirm that MDOT has evaluated well location.

### 3.02 TRENCHING

- A. See section 02315 and 02317 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

### 3.03 INSTALLATION - PIPE

- A. Service line from existing well shall be furnished and installed to serve the project. The project contract work shall begin at indicated well and shall include all water lines, valves, and appurtenances as shown on the drawings, except as indicated otherwise.
- B. Pipe-Laying - General:
  - 1. The interior of all pipe shall be clean and joint surfaces wiped clean and dry before the pipe is lowered into trench. Lower each pipe, fitting and valve into the trench carefully and lay true to line and without objectionable breaks in grade. The depth of cover below finished grade shall be not less than 5'-6" and the standard cover shall be 6'-0".
  - 2. Provide uniform bearing for all pipe in trenches. Do not allow trench water or dirt to enter the pipe after laying. Insert a watertight plug in the open end of the piping while laying of pipe is not in progress.
  - 3. Do not lay pipe closer than 10 feet to a sewer. At cross-overs with sewers, no joint in the water line shall be closer than 6 feet from the cross- over point. A minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer shall be maintained when the water main is either above or below the sewer. Provide valves, plugs or caps, as required, where pipe ends are left for future connections.
- C. All pipe shall be laid with standard provisions for expansion and contraction and in accordance with manufacturer's recommendations.
- D. Install suitable fittings at all changes in direction, dead ends and branch connections, provided

that double strap saddles, in lieu of tees, may be used for service taps.

- E. Before setting each valve, make sure that the interior is clean, and test opening and closing. Set valves and stops with stems plumb and at the exact location shown. Provide brick laid flat, or other similar foot-pieces, under each curb box. Valve and service boxes shall be plumb, with tops at finished grade.
- F. Route pipe in straight line or as depicted on the plans.
- G. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- H. Slope water pipe and position drains at low points.
- I. Connect to building water outlets.

#### 3.04 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01400.
- B. Pressure test water piping to 100 psi (689.5 kPa).
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION



## SECTION 02535 - SANITARY SEWER PIPING

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Sanitary sewerage drainage piping, fittings, and accessories.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section
- B. Section 02250 - Dewatering
- C. Section 02315 - Common Excavation Embankment and Compaction.
- D. Section 02317 - Trenching.
- E. Section 02640 - Manholes and Covers.

#### 1.03 REFERENCES

- A. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 1989 (Reapproved 1995).
- B. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 1996a.
- C. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 1998.

#### 1.04 SUBMITTALS

- A. Product Data: Provide data indicating pipe, pipe accessories.

#### 1.05 REGULATORY REQUIREMENTS

- A. Perform work in accordance with the Subsurface Wastewater Disposal Rules.

#### 1.06 PROJECT CONDITIONS

- A. Coordinate the Work with termination of sanitary sewer connection outside building, connection to subsurface wastewater disposal system, and trenching.

### PART 2 - PRODUCTS

#### 2.01 SEWER PIPE MATERIALS

- A. Plastic Pipe: ASTM D 3034, Type PSM, Poly(Vinyl Chloride) (PVC) material rated SDR 35; inside nominal diameter of 8 inches (20.3 mm), bell and spigot style solvent sealed joint end.
- B. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM classification.

- C. Pipe joints shall be integrally molded bell ends in accordance with ASTM D-3034 Table 2, with factory supplied elastomeric gaskets and lubricant.
- D. Polyvinyl Chloride Pressure Sewer:
  - 1. Pipe and fittings shall comply with ASTM D2241 rated SDR 18 and shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating and ASTM D2241 classification
  - 2. Joints shall be integral gasketed joints formed on a continuous pipe length, utilizing elastomeric seal such as "Ring Tite" as manufactured by Johns Manville Company.
- E. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

### PART 3 - EXECUTION

#### 3.01 TRENCHING

- A. See Section 02317 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

#### 3.02 INSTALLATION - PIPE

- A. Make all required connections to existing sewers. Carry out such work in accordance with local standards. Observe care to prevent debris from entering sewers. Check the invert elevations of existing sewers to which connections are to be made, and if appreciable difference from elevations noted on the drawings, or if they involve any difficulty in obtaining necessary drainage, notify the Engineer immediately so that appropriate corrective action may be taken.
- B. Commence at the lowest point in the system and lay the pipe with the bell-end upgrade. Test pipe for soundness and clean interior and joint surfaces before lowering the pipe into the trench. Lay pipe in straight lines and on uniform grades between points where changes in alignment or grade are shown. Bed the pipe barrel uniformly.
- C. Comply fully with manufacturer's instructions for sewer pipe jointing, using sealing or lubricating compound as supplied by the manufacturer, and apply proper pressure to seal the spigot in the bell.
- D. As soon as the joint material has set, pack fine earth carefully around the joints, and around and over the pipe. Carry this backfill operation to a depth of at least 12 inches above the top of the pipe. Care shall be used in tamping backfill under lower parts of the pipe to give proper support, especially in shallow trenches.
- E. Flush all sanitary sewers, including building connections, with water in sufficient volume to obtain free flow through each line. Remove any obstructions and correct any defects discovered.
- F. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- G. Install pipe, fittings, and accessories in accordance with ASTM D 2321 and manufacturer's instructions. Seal joints watertight.
- H. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).

- I. Connect to building sanitary sewer outlet.

### 3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with the requirements of the servicing utility.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

### 3.04 TESTING OF SANITARY SEWER FORCE MAIN

- A. Leakage in pressure main shall not exceed 0.30 gallons per 1,000 feet-gph. The Contractor shall furnish all necessary equipment and personnel for making such tests. Should the pipe fail to meet the leakage requirements, it shall be re-excavated and repaired by the Contractor.

### 3.05 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION





## SECTION 02560 - SEWAGE PUMP STATION

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Furnishing, installation, startup and testing of a submersible sewage pump station, and associated electrical work.
  - 2. Work shall comply with all local, state, and federal electrical and sanitary codes.
- B. Design Basis
  - 1. The pump station is designed as a duplex submersible sewage pump station. The pump rate shall be 20 gallons per minute at 18.1 feet of total dynamic head.
  - 2. Other system head curve data is as follows:
    - a. 

Flow Rate (GPM)	TDH (ft.)
1) 10	13.45 to 15.65
2) 20	16.15 to 18.35
3) 30	20.33 to 22.53
4) 40	25.90 to 28.10
    - 3. The pumps shall be Myers WHR5-DS pump, 1750 rpm.
    - 4. The pump motors shall be submersible explosion proof design.
    - 5. The pump motors shall be single phase, .5 HP, 230 volt.
    - 6. The pumps and station shall be equipped with breakaway couplings, rails and lift chain to permit pump removal.
    - 7. The pump controller shall be a duplex control panel located within building.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section
- B. Section 02315 - Common Excavation, Embankment and Compaction .
- C. Section 02535 - Sanitary Sewer Piping .
- D. Construction Drawings.
- E. Local Governing Authority and Code Requirements.
- F. All necessary construction permits.

### PART 2 - PRODUCTS

#### 2.01 PUMP CONSTRUCTION

- A. Impeller shall be cast iron, vortex design.
- B. Volute shall be of one-piece design, cast iron ASTM A48, class 30.

- C. Base: A tripod base designed to support the total unit weight shall be supplied. It is to be bolted directly to the volute suction flange and avoid interference with the impeller eye.
- D. Shaft: A common pump and motor shaft shall be provided. The shaft shall be high quality alloy, type 416 stainless steel.
- E. Discharge (Breakaway) Coupling: The coupling shall be cast iron and an integral part of the pump design.
- F. Guide Pipes: The guide pipe system shall consist of two non-sparking pipes UL listed for Class I, Group C and D, Division 1. These pipes shall terminate on the discharge elbow and a bracket provided by manufacturer attached to access cover. The movable bracket shall engage a minimum of 20 inches of the guide pipes at any one time and shall wrap around the guide pipes in excess of 180 degrees. None of the pump weight shall bear on guide pipes. This arrangement shall allow installation of guide pipes with no intermediate supports.
- G. Lifting Chain
  - 1. Galvanized.
  - 2. Design and length recommended by pump manufacturer.
  - 3. One for each pump.
- H. Motors
  - 1. 0.5 horsepower, 1750 rpm, single phase, and 230 volt. Motors shall be explosion proof and UL listed for Class I, Group C and D, Division 1.
    - a. External hardware including motor nameplate: stainless steel.
    - b. Lifting eyes: Cast into motor housing and capable of lifting entire pump motor assembly.
    - c. Double mechanized oil-filled seals for protection of electrical components are required.
    - d. Provide moisture sensing probes and thermal protectors. Provide moisture sensing relay and sensor test switch in control panel.

## 2.02 PIPE AND VALVING

- A. All pipe and valving shall be cast/ductile iron with 125 lb. ANSI standard flanges.
- B. Elbows to be long radius.
- C. All pipe to be cement lined.
- D. Check valve to 150#, cast iron body w/ external level.
- E. Gate valve to be 85-5-5 bronze body with cast iron handwheel.
- F. All piping in station to be by pump station manufacturer.
- G. Paint with epoxy paint in accordance with 10 State Standards and/or TR-16 manual "Guides for the Design of Wastewater Treatment Works."

## 2.03 CONCRETE COMPONENTS

- A. Provide in accordance with Sections 02640.

## 2.04 ACCESS COVERS FOR WET WELL

- A. Design: "Bilco" style.
- B. Material: Aluminum Plate.

SEWAGE PUMP STATION

02560 - 2

- C. Live Load: 300 pounds per square foot.
- D. Hinges:
  - 1. Concealed.
  - 2. Spring Type.
  - 3. 90 degrees opening.
- E. Locks: Slam lock with removable key wrench and provide hasp for padlock.
- F. Cast frame into wet well cover and valve chamber flush with top.

## 2.05 MISCELLANEOUS

- A. Attach a durable "No Smoking" and "Confined Space Entry Permit Required" sign to inside of access covers.

## 2.06 CONTROL PANELS

- A. Provide a control system with intrinsically safe relays to control the constant speed wastewater pumps at pump station.
- B. The control system shall initiate starting and stopping of pump motors and provide high and low level alarm and pump failure for use with the annunciator system.
- C. Automatic Pump Controls
  - 1. Provide liquid level controls in combination with a starter or panel.
  - 2. Type: Mercury float switches in unbreakable steel shell encased in solid polyurethane suitable for continuous immersion or engineer approved equal.
- D. High Water and Low Water Level Alarms
  - 1. Provide water level alarms with contact closure inputs to a single terminal strip for use with local annunciator.
  - 2. Low level alarm when activated shall also stop pumps.
  - 3. Type: Mercury float switches in unbreakable steel shell encased in solid polyurethane suitable for continuous immersion or engineer approved equal.
- E. Pump Failure Alarm
  - 1. Provide one for each pump.
  - 2. Capable of sensing unusually high and low current demands by the pump.
  - 3. Provide contact closure inputs to a signal terminal strip for use with local annunciator.
  - 4. Connect to pump control panel to allow shutdown of pump.
- F. Electrical Control
  - 1. Provide an automatic pump control center in a NEMA 1 enclosure for voltage and phase indicated.
  - 2. Provide the following for each pump motor:
    - a. Combination breaker/overload unit providing overload protection, short circuit protection, and a reset and disconnect for all phases.
    - b. Across-the-line magnetic conductors.
    - c. Hand/off/automatic pump operations selector switch.
    - d. Overload device, precalibrated to match motor characteristics and factory sealed to ensure trip setting is tamperproof.
    - e. Control pilot circuitry: 120 volt.
  - 3. Provide one control circuit transformer for external pilot circuitry for pump station with automatic electric alternator for duplex pump stations (providing alternating operation of

- pumps under normal conditions, wire with capability for both pumps to run at high level alarm).
4. Provide terminal boards for connection of line, pump and level sensors.
  5. Provide alarm indicator lights on inner control panel door.
  6. Provide external electrical control module alarm light to indicate low water, high water, and pump failure.
- G. Provide following items for each pump station:
1. Lightning arrestor.
  2. Elapsed time meters for each pump.
  3. Running lights.
  4. Event counter for each pump.
  5. External mounted alarm light.

## 2.07 SOURCE QUALITY CONTROL

- A. Test and inspect pump station system prior to shipment.
- B. The pump manufacturer shall perform the following inspections and tests on each pump before shipment from factory
1. Check impeller, motor rating and electrical connections for compliance with customers' purchase order.
  2. Perform a motor and cable insulation test for moisture content or insulation defects.
  3. Prior to submergence, run the pump dry to establish correct rotation and mechanical defects.
  4. Run pump submerged in water at a minimum depth of 6 feet.
  5. After operational test above, perform insulation test again.
- C. The pump manufacturer shall submit a written report with shipment of each pump verifying the tests required in 2.07B above have been done.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify surfaces are ready to receive work.
- B. Verify field measurements are as shown on shop drawings.
- C. Verify that required utilities are available, in proper locations and ready for use.
- D. Beginning of installation means installer accepts existing conditions.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install concrete structures in accordance with Section 02640.
- C. Adjust installed units for smooth and balanced operation.
- D. Rub finish exposed portions of concrete components.

### 3.03 MANUFACTURERS' FIELD SERVICE

- A. Prepare, inspect, start and test systems under observation of owner and Part 4.

### 3.04 LEAKAGE TESTING

- A. Perform leakage tests in concrete structures in accordance with Section 02640.

### SHOP DRAWINGS AND START UP

#### 4.01 SHOP DRAWINGS

- A. The Contractor shall submit to the Engineer for his review, Shop Drawings, descriptive data, performance characteristics, material specifications, and wiring diagrams as appropriate, showing conformance to all equipment to the Contract Drawings and Specifications.
  - 1. Except where specified otherwise, three (3) copies of the manufacturer's actual test data and interpreted results thereof, accompanied by a certificate of authenticity sworn to be a responsible official of the manufacturing company, shall be forwarded to the Engineer for approval.

#### 4.02 EQUIPMENT TESTS

- A. Shop Tests:
  - 1. Where required by the detailed equipment specification, each piece of equipment for which pressure, duty, capacity, efficiency, performance, function, or special requirements are specified, shall be tested in the shop of the maker in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract documents and that it will operate in the manner specified or implied. No such equipment shall be shipped to the project until the Engineer has been furnished a certified copy of test results and has notified the Contractor, in writing, that the results of such tests are acceptable. When called for in the detailed equipment specifications in other sections, arrangements shall be made for the Engineer to witness performance tests in manufacturer's shop for approval.

#### 4.03 PRELIMINARY FIELD TESTS

- A. As soon as conditions permit, the Contractor shall furnish all labor, materials, and instruments, and shall make preliminary field tests of equipment. If the preliminary field tests disclose that any equipment furnished under this Contract does not comply with the requirements of the Contract Documents, the Contractor shall, prior to the acceptance tests, make all changes, adjustments, and replacements required.

#### 4.04 FINAL FIELD TESTS

- A. Upon completion of the work and prior to acceptance and final payment, all equipment and appliances installed under this Contract shall be subjected to tests for compliance with the Contract Documents. The Contractor shall furnish labor, fuel, lubricants, energy, water and all materials, equipment, and instruments necessary for all acceptance tests.

#### 4.05 FAILURE TESTS

- A. Any defects in the equipment or failure to meet the guarantees or requirements of the Specifications, shall be promptly corrected by the Contractor by the replacement or other means as required. The decision of the Engineer as to whether or not the Contractor fulfilled his obligations under the contract or Contractor fails to make these corrections, or if the improved equipment when tested shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and material which have entered into the manufacture of said equipment, may reject said equipment and order the

Contractor to remove it from the premises at the Contractor's expense.

#### 4.06 RESPONSIBILITY DURING TESTS

- A. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally accepts the equipment.

#### 4.07 TOOLS, ACCESSORIES, AND SPARE PARTS

- A. Tools: The Contractor shall furnish with each type, kind or size of equipment any special suitably marked high-grade tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be properly labeled and delivered to the Owner prior to the initial operation of the equipment.
- B. Spare Parts: The Contractor shall obtain from each equipment supplier, a list of spare parts for the equipment furnished, including a manufacturer's recommendation for parts which are required or recommended to be replaced during the first year of operation. This listing shall be included in the Shop Drawing Submittals. The parts required for first year replacement shall be supplied as part of the contract.

#### 4.08 MANUFACTURER'S SERVICES

- A. The Contractor, through an authorized manufacturer's service representative to assist the Contractor, when required, to install, adjust, and test the equipment in conformity with the Contract Documents. When the equipment is placed in permanent operation by the Owner, such representative shall be on hand to make all adjustments and test necessary or required by the Specifications and Engineer to provide that such equipment is in proper and satisfactory operating condition.
- B. The manufacturer's representative shall also instruct the Owner's operation personnel in operating and maintenance of the equipment. Two copies of written reports by the representative covering inspection, testing, and instruction shall be sent directly to the Engineer. An additional copy shall be sent to the Contractor.
- C. The Contractor shall include in his contract price provisions for the service of Manufacturer's Representatives for a minimum of one (1) day supervision of installation and one (1) day supervision of initial operation and operator instruction for each of the equipment items. The cost for these services shall be part of the equipment price quoted to the Contractor.

END OF SECTION

## SECTION 02580 - PAVEMENT MARKINGS

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. The extent of pavement marking is shown on the drawings.
- B. Work includes, but is not limited to, the following:
  - 1. Parking stall divider lines.
  - 2. Diagonal striping.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section
- B. Section 02741\_- Bituminous Concrete Paving.

#### 1.03 REFERENCES

- A. State of Maine Department of Transportation Standard Specifications Highways and Bridges, latest revision, hereafter designated as MDOT Specifications.
- B. ASTM D 93, D 562, D 711, D 821, D 1210, D 1475, D 1640, D 2243, D 2369, D 2486, D 3723, D 3960, E 70, and G 53.
- C. DOT Code of Federal Regulations, Hazardous Materials and Regulations Board, Reference 49CFR, ICC Regulations.
- D. Federal Specification TT-P-115E, Type III (Type I if V.O.C. compliance required), colors 33538 and 37038.

#### 1.04 QUALITY ASSURANCE

- A. Perform work in accordance with MDOT Specifications 627 .
- B. Striping and graphics must comply with requirements of the ADAAG Standards and state and local accessibility requirements. If there is conflict between a federal requirement and a state or local requirement, striping must comply with the more stringent requirement.



## 1.05 SUBMITTALS

- A. Shop Drawings: Indicate sizes, shapes, patterns, and colors of marking, and manufacturers and types of paints.

## 1.06 DELIVERY, STORAGE AND HOLDING

- A. Deliver all materials to the job site with all labels intact and legible at time of installation.
- B. Store materials off ground under cover. Protect from damage or deterioration.
- C. Handle materials so as to prevent damage to surface, edges, ends, and factory applied finishes of items. Damaged material shall be rejected and replaced.

## 1.07 GUARANTEE

- A. Contractor shall guarantee entire installation for one (1) year from turnover date.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Subject to compliance with requirements, provide ready-mixed one component water borne traffic line paint. Materials shall be listed on the Department of General Services Office of Procurement Qualified Products List.
- B. Paints shall contain all necessary co-solvents, dispersants, wetting agents, preservatives, and all other additives, so that paint shall retain viscosity. Halogenated solvents and glass beads shall not be permitted.
- C. Volatile Organic Compound (VOC) content shall not exceed 250 grams maximum per liter of paint as determined in accordance with ASTM D 3960 test, excluding water and exempt solvents.
- D. Yellow shall match Federal 595a Color 33538. Black shall match Federal 595a Color 37038.
- E. Conforming to AASHTO and MUTCD Specifications.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Installer shall examine the substrates and conditions under which materials are to be installed,

and notify the Owner in writing of conditions detrimental to the completion of the work. Do not proceed with the work until traffic lines are completed and properly dry.

- B. Coordinate provisions for installation with work of other trades.
- C. All parking area marking and painting to be protected by appropriate traffic barriers, lighted if necessary, so located as to prohibit parking and traffic until permission for such is given by the Owner.

### 3.02 INSTALLATION

- A. Install pavement marking in accordance with approved shop drawings and applicable codes and standards.
- B. Traffic paint shall be installed in two coats. The first coat shall be installed at 1/2 the recommended coverage rate after paving is in place; the second coat shall be installed at full recommended rate 30 days later.
- C. Do not apply pavement markings until adequate time has passed after pavement installation.
- D. Apply paint to clean, dry surfaces by any method yielding sharp definition edges. Air temperature 50 degrees minimum.

### 3.03 PAINTING

- A. Parking stall, division, and limit lines shall be 4" in width, true and straight. Color: Yellow.
- B. Diagonal striping. Color: Yellow

### 3.04 COMPLETION

- A. During the progress of the work, the premises shall be kept free of debris and waste resulting from the work in this section. Upon completion, all surplus material and debris shall be removed from the site.
- B. At completion of work, touch up minor damage to prefinished surfaces to the satisfaction of the Owner. Replace materials damaged or stained during installation.

END OF SECTION



## SECTION 02635 - STORM DRAINAGE PIPING

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Storm drainage piping, fittings, and accessories.
- B. Foundation drainage piping and accessories.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. Section 02250 - Dewatering
- C. Section 02315 - Common Excavation, Embankment and Compaction
- D. Section 02317 - Trenching for Site Utilities.
- E. Section 02640 - Manholes and Covers.

#### 1.03 REFERENCES

- A. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 1996b.
- B. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 1989 (Reapproved 1995).
- C. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 1996a.
- D. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 1998.

#### 1.04 SUBMITTALS

- A. Product Data: Provide data indicating pipe, pipe accessories.
- B. Project Record Documents:
  - 1. Record location of pipe runs, connections, cleanouts, and invert elevations.
  - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

#### 1.05 PROJECT CONDITIONS

- A. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to foundation drainage system.

### PART 2 - PRODUCTS

#### 2.01 STORM DRAIN PIPE MATERIALS

- A. Corrugated Polyethylene Pipe (PE): Pipe complying with AASHTO M294 and MP7, and ASTM D3550. Interior of pipes shall be smooth, and shall have an "n" value of not less than 0.010. Pipes shall be joined with gasketed bell and spigot joints complying with ASSHTO M252 and M294. Gaskets shall comply with ASTM F477 and ASTM D1149. Provide minimum coverage per manufacturer's specifications.
  - 1. Acceptable Manufacturers of Corrugated Polyethylene Pipe: Hancor "Sure Lok", or Equal.
- B. Plastic Pipe: ASTM D 3034, Type PSM, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of specified inches, bell and spigot style solvent sealed joint end.
- C. Building foundation drain: 4" dia. SDR-35 perforated underdrain pipe.

## 2.02 UNDERDRAIN PIPE MATERIALS

- A. Pipe shall conform to ASTM/ANSI D 2729 or ASTM F 810. Minimum crush length shall be 1500 PSI. Standard laying length shall be 10 ft. with bell and spigot ends. Perforations shall be 5/8" or 3/4" holes on 5" centers and in three rows 120 degrees apart.

## 2.03 PIPE ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

## PART 3 - EXECUTION

### 3.01 TRENCHING

- A. See Section 02317 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

### 3.02 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
- C. Install pipe, fittings, and accessories in accordance with ASTM D 2321 and manufacturer's instructions. Seal joints watertight.
- D. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).

### 3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance requirements of local authorities having jurisdiction

### 3.04 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

## SECTION 02640 - MANHOLES AND COVERS

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.
- B. Modular precast catch basins with frames and grates.
- C. Precast concrete septic tank and pump station.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. Section 02250 - Dewatering
- C. Section 02315 - Common Excavation, Embankment, and Compaction.
- D. Section 02317 - Trenching
- E. Section 02535 - Sanitary Sewer Piping.

#### 1.03 REFERENCES

- A. ASTM C 478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 1997.
- B. ASTM C 478M - Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric); 1997.
- C. ASTM C 923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals; 1996.
- D. ASTM C 923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals (Metric); 1996.

#### 1.04 SUBMITTALS

- A. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.
- B. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Manhole and Catch Basin Sections: Reinforced precast concrete in accordance with ASTM C 478 (ASTM C 478M), with gaskets in accordance with ASTM C 923 (ASTM C 923M).
  - 1. Use concrete that will attain a 28-day compressive strength of not less than 4,000 psi.
  - 2. Reinforcing: H-20 loading.
  - 3. Horizontal Joints:
    - a. Tongue and Groove formed of concrete to receive a flexible plastic gasket.
    - b. Joints to be watertight.
    - c. Cast to allow installation to be vertical and in true alignment.
  - 4. Provide two tapered lifting holes 180 degrees apart in each section for handling and placing.
  - 5. Base Section: Cast holes for pipes to provide invert elevations as required by Drawings.
  - 6. Pipe to Structure Joints:
    - a. Flexible sleeves, rubber quality, ASTM C-443 and C361 cast into base.
    - b. If pre-manufactured adaptor cannot be installed, use rubber concrete adaptor designed to provide a watertight seal between pipe and structure.
- B. Mortar and Grout : ASTM C270, using the proportion specification.
  - 1. Masonry below grade and in contact with earth: Type S.
- C. Concrete Masonry Units: ANSI/ASTM C139.
- D. Manhole Brick: ANSI/ASTM C32, Grade MS.
- E. Sewer Brick: ANSI/ASTM C32, Grade SS.
- F. Masonry Mortar: ANSI/ASTM C270, Type M.
- G. Manhole Frames and Covers: Grey cast iron, ANSI/ASTM A 48, Class 30 B.
  - 1. Furnish covers with cast-in legend on roadway face as indicated.
- H. Manhole Steps: Polypropylene steps meeting the requirements of ASTM C-478 and AASHTO M-199. Polypropylene conforms to ASTM D-4101. Grade 60, 1/2 inch diameter reinforcing bar meeting the requirements of ASTM A-615.
- I. Catch Basin Frames and Gratings: Grey cast iron, ANSI/ASTM A 48, Class 30 B.
- J. Other Precast Structures (including but not limited to septic tank, pump station and risers):
  - 1. Use concrete that will attain a 28-day compressive strength of not less than 4,000 psi.
  - 2. Manufactured in accordance with ASTM C-478.
  - 3. Reinforcing: H-20 loading.
  - 4. Horizontal Joints:
    - a. Tongue and groove formed of concrete to receive a flexible plastic gasket.
    - b. Joints to be watertight.
    - c. Cast to allow installation to be vertical and in true alignment
  - 5. Pipe to Structure Joints:
    - a. Flexible sleeves, rubber quality, ASTM C-433 and C-361 cast into base.
    - b. If pre-manufactured adaptor cannot be installed, use rubber-concrete adaptor designed to provide a watertight seal between pipe and structure.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for manholes is correct.

### 3.02 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

### 3.03 PRECAST CONCRETE STRUCTURES

- A. Precast Concrete Structures: Place precast concrete sections as shown on drawings. Where structures occur in pavement, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.
  - 1. Use epoxy bonding compound where manhole steps are mortared into structure walls
  - 2. Provide rubber joint gasket complying with ASTM C443.
  - 3. Place base section level on 12 inch layer of crushed stone.
  - 4. Fix inlet and outlet stubs into sleeves with stainless steel pipe clamp.
  - 5. Place barrel sections, cones or tops of the appropriate combination of heights to meet grades required by Drawings or existing conditions.
  - 6. Seal horizontal joints as recommended by manufacturer.
  - 7. Apply lubricant to inside tongue and rubber gaskets immediately prior to joining sections.
  - 8. Fill lifting holes with non-shrink mortar.
  - 9. Place frame and grate on top or otherwise prevent accidental entry by unauthorized persons until ready for adjustment to grade.
  - 10. Repair damaged coating of frames and covers with coat-tar-pitch varnish.

### 3.04 MASONRY WORK

- A. Laying Brick:
  - 1. Use clean bricks.
  - 2. Lay brick by methods consistent with the trade acceptable to Owner
  - 3. Lay in a full bed of mortar and joint without subsequent grouting, flushing, or filling, and thoroughly bond.
  - 4. Bring casting rim to grade with brick and coat outside with mortar; minimum thickness 3/8 inch with troweled waterproof surface.

### 3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with the requirements of the servicing utility.
- B. Provide copies of test report to owner and servicing utility, documenting results and compliance with requirements in advance of requesting a certificate of occupancy.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION





## SECTION 02741 - BITUMINOUS CONCRETE PAVING

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Hot bituminous concrete paving.
- B. Hot bituminous concrete sidewalk paving.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section
- B. Section 02315 - Common Excavation, Embankment and Compaction.
- C. Section 02317 - Trenching.

#### 1.03 REFERENCES

- A. State of Maine Department of Transportation Standard Specifications Highways and Bridges, latest revision, hereafter designated as MDOT Specifications.

#### 1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with MDOT Section 403.
- B. Mixing Plant: Conform to MDOT Section 401.
- C. Obtain materials from same source throughout.

#### 1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for paving work on public property.

#### 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Weather and seasonal limitations as required by MDOT Section 401.07 shall apply to this Section.

#### 1.07 TESTS

- A. Submit proposed mix design of each class of mix for review prior to commencement of work.
  - 1. Mix design must be for current year.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Asphalt Cement: MDOT Section 702.
- B. Hot Bituminous Pavement: MDOT Section 401.02 through 401.06.
- C. Mineral Filler: MDOT Section 703.

D. Emulsified Bituminous Sealing Compound: MDOT Section 702.12

E. Tack Coat: Emulsified asphalt, RS-1 of HFMS-1.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Beginning of installation means acceptance of substrate.

#### 3.02 PREPARATION AND PLACEMENT

- A. Tack Coat shall be applied to any existing pavement at a rate of approximately 0.025 gal/sq yd, and on milled pavement approximately 0.05 gal/sq yd, prior to placing new course. All joints between existing and new pavement will be tacked.
- B. Prepare and place plant mix hot bituminous pavement in accordance with MDOT Sections 301 and 401.
  - 1. Compaction of the new Hot Mix Asphalt Pavement will be obtained using a minimal roller train consisting of a 3-5 ton vibratory roller.
  - 2. An approved release agent is required to ensure the mixture does not adhere to hand tools, rollers, pavers and truck bodies. The use of petroleum base fuel oils will not be permitted.
  - 3. The Department will pay for the work specified in subsection 401.11 for the HMA used, except that cleaning objectionable material from the pavement and furnishing and applying Item 409.15 bituminous material to joints and contact surfaces is incidental.

#### 3.03 TOLERANCES

- A. Flatness: Conform to requirements of MDOT Section 401.20.
- B. Compacted Thickness: Conform to requirements of MDOT Section 401.17.
- C. Variation from True Elevation: Conform to requirements of MDOT Section 403.

#### 3.04 FIELD QUALITY CONTROL

- A. Provide field inspection and testing. Take samples and perform tests in accordance with MDOT Specifications Section 401.19 Method C
- B. Refer to Special Provision Section 403 - Attached

#### 3.05 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 5 days.

### 3.06 ATTACHMENTS

A.

#### **SPECIAL PROVISION** **SECTION 403** **HOT MIX ASPHALT**

Desc. of Course	Grad. Design	Item Number	Bit Cont. % of Mix	Total Thick	No. Of Layers	Comp. Notes
<b><u>Truck Weigh Station</u></b>						
Wearing	12.5 mm	403.208	N/A	1 ½"	1	4,9,17
Base	19.0 mm	403.207	N/A	2 ½"	1 /more	4,9,17
<b><u>Sidewalks, Misc.</u></b>						
Wearing	9.5mm	403.209	N/A	2"	1/more	2,3,9,13

#### **COMPLEMENTARY NOTES**

2. The density requirements are waived.
4. The design traffic level for mix placed shall be 0.3 to <3 million ESALS.
9. Section 106.6 Acceptance, (2) Method C - For hot mix asphalt items designated as Method C in Special Provision Section 403 --Hot Mix Asphalt, one sample will be taken from the paver hopper or the truck body per 250 ton, per pay item. The mix will be tested for gradation and PGAB content. Disputes will not be allowed. If the mix is within the tolerances listed in Table 9, Method C the Department will pay the contract unit price.

Table 9

Property	USL and LSL
	Method C
Percent Passing 4.75 mm [No. 4] and larger sieves	Target ± 7
Percent Passing 2.36 mm [No. 8] to 1.18 mm [No. 16] sieves	Target ± 5
Percent Passing 0.60 mm [No. 30]	Target ± 4
Percent Passing 0.30 mm {No. 50} to 0.075 mm [No. 200] sieve	Target ± 3
PGAB Content	Target ± 0.5

If the test results for each 250 ton increment are outside these limits the following deductions (Table 9b) shall apply to the HMA quantity represented by the test. A second consecutive failing test shall result in cessation of production

TABLE 9b

PGAB Content	-5%
2.36 mm sieve	-2%
0.30 mm sieve	-1%
0.075 mm sieve	-2%

13. A mixture meeting the requirements of section 703.09 Grading 'D', with a minimum PGAB content of 6%, and the limits of Specification 401, Table 7 (Drives and Sidewalks) for PGAB content and gradation may be substituted for this item. A job mix formula shall be submitted to the department for approval.
17. Compaction of the new Hot Mix Asphalt Pavement will be obtained using a minimal roller train consisting of a 3-5 ton vibratory roller. An approved release agent is required to ensure the mixture does not adhere to hand tools, rollers, pavers, and truck bodies. The use of petroleum base fuel oils will not be permitted.

The Department will pay for the work specified in Subsection 401.11 for the HMA used, except that cleaning objectionable material from the pavement and furnishing and applying Item 409.15 bituminous material to joints and contact surfaces is incidental.

#### Tack Coat

A tack coat of emulsified asphalt, RS-1 or HFMS-1, Item 409.15 shall be applied to any existing pavement at a rate of approximately 0.025 gal/yd<sup>2</sup>, and on milled pavement approximately 0.05 gal/yd<sup>2</sup>, prior to placing a new course. All joints between existing and new pavement will be tacked.

END OF SECTION

## SECTION 02921 – SEEDING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Preparation of subsoil.
- B. Seeding and Hydroseeding, mulching and fertilizer.
- C. Maintenance.

#### 1.02 RELATED SECTIONS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. Section 02315 - Common Excavation, Embankment and Compaction.
- C. Section 02317 - Trenching.

#### 1.03 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

#### 1.04 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

#### 1.06 MAINTENANCE SERVICE

- A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for two cuttings.

### PART 2 PRODUCTS

#### 2.01 SEED MIXTURE

- A. Seed Mixture:
  - 1. Kentucky Blue Grass: 45 percent.
  - 2. Creeping Red Fescue Grass: 45 percent.
  - 3. Annual Ryegrass: 10 percent.

## 2.02 SOIL MATERIALS

- A. Topsoil: Either stripped from site or imported, friable loam; free of subsoil, large clods, lumps, roots, grass, excessive amounts of weeds, stone and foreign matter 2" or greater and smaller stones in excessive quantities as determined by the Owner; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4 percent and a maximum of 25 percent organic matter.

## 2.03 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- B. Fertilizer: Use only fertilizer recommended for intended use, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions: Nitrogen 10 percent, phosphoric acid 20 percent, soluble potash 20 percent.
- C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
- D. Erosion Fabric: Jute matting, open weave.
- E. Lime: Ground limestone, dolomite type, minimum 95 percent carbonates.
- F. Anti-Dessicant: Emulsion type, film forming agent. Mix according to manufacturer's direction.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section.
- B. Beginning of installation means acceptance of existing conditions.

### 3.02 PREPARATION OF SUBSOIL

- A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds, and undesirable plants and their roots. Remove contaminated subsoil.
- C. Scarify subsoil to a depth of 4 inches where topsoil is to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

### 3.03 PLACING TOPSOIL

- A. Spread topsoil to a minimum depth of 4 inches over area to be seeded. Rake smooth
- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas and to ensure positive drainage. Maintain levels, profiles and contours of subgrade.
- E. Manually spread topsoil around trees, plants, buildings and other appurtenances to prevent damage.
- F. Stockpile surplus topsoil on site.

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- G. Leave stockpile area and site clean, raked, ready for seeding.

### 3.04 TOLERANCES

- A. Top of topsoil: Plus or minus 1/10th foot.

### 3.05 FERTILIZING AND LIMING

- A. Apply fertilizer and lime in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil.
- C. Do not apply fertilizer and lime at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

### 3.06 SEEDING

- A. Seed disturbed areas not designated for any other treatment.
- B. Apply seed at a rate of 1.03 lbs per 1000 sq ft (5 Kg per 1000 sq m) evenly in two intersecting directions. Rake in lightly.
- C. Do not seed areas in excess of that which can be mulched on same day.
- D. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- E. Immediately following seeding, apply mulch. Maintain clear of shrubs and trees.
- F. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.
- G. Anchor mulch in place with erosion control mesh.

### 3.07 HYDROSEEDING

- A. Seed disturbed areas not designated for any other treatment.
- B. Apply seeded slurry with a hydraulic seeder at a rate of 25 lbs lime, 30 lbs of 10-10-10 fertilizer, 3 lbs seed, and 5 lbs birdsfoot trefoil lbs per 1000 sq ft (308 Kg per 1000 sq m) evenly in two intersecting directions, with a hydraulic seeder in accordance with MDOT Specification Section 618.07.
- C. Do not hydroseed area in excess of that which can be mulched on same day.
- D. Immediately following seeding, apply mulch. Maintain clear of shrubs and trees.
- E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.

### 3.08 SEED PROTECTION

- A. Cover seeded slopes where grade is 4 inches per foot (328 mm per m) or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- B. Lay fabric smoothly on surface, bury top end of each section in 6 inch (150 mm) deep excavated topsoil trench. Provide 12 inch (300 mm) overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

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- C. Secure outside edges and overlaps at 36 inch (900 mm) intervals with stakes.
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches (150 mm).

### 3.09 MAINTENANCE

- A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches (65 mm). Do not cut more than 1/3 of grass blade at any one mowing.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming.
- D. Water to prevent grass and soil from drying out.
- E. Roll surface to remove minor depressions or irregularities.
- F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- G. Immediately reseed areas that show bare spots.
- H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

## SECTION 03300 – CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes, and underslab vapor barrier system.
  - 1. All formwork, and reinforcing for the scale pit, scale platforms, and concrete scale approaches shall be by section 11161 "Truck Scales" but shall follow the requirements of this section.
- B. Related Sections include the following:
  - 1. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.

#### 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

#### 1.4 REFERENCES

- A. American Concrete Institute (ACI):
  - 1. 117 - Specifications for Tolerances for Concrete Construction and Materials
  - 2. 301 - Specifications for Structural Concrete for Buildings
  - 3. 305R - Hot Weather Concreting
  - 4. 306R - Cold Weather Concreting
  - 5. 309R - Guide for Consolidation of Concrete
  - 6. 315 - Manual of Standard Practice for Detailing Reinforced Concrete
  - 7. 347 - Recommended Practice for Concrete Formwork
  - 8. 318 - Building Code Requirements for Reinforced Concrete
  - 9. 544.1R - State-of-the-Art Report of Fiber Reinforced Concrete

#### CAST-IN-PLACE CONCRETE

10. 554.2R - Measurement of Properties of Fiber Reinforced Concrete

B. American Society for Testing and Materials (ASTM):

1. A 185 - Welded Steel Wire Fabric for Concrete Reinforcement
2. A 615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
3. C 33 - Concrete Aggregate
4. C 39 - Compressive Strength of Cylindrical Concrete Specimens
5. C 94 - Ready-Mixed Cement
6. C 150 - Portland Cement
7. C 260 - Air-Entraining Admixtures for Concrete
8. C 309 - Liquid Membrane-Forming Compounds for Curing Concrete
9. C 494 - Chemical Admixtures for Concrete
10. C 1018 - Standard Test Method for Flexural Toughness and First-Crack Strength of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading)
11. C 1116 - Type III, Sections 4.1.3 and 4.2, and Performance Level I, Toughness Index 15 outlined in Section 21, Note 17, Standard Specification for Fiber-Reinforced Concrete and Shotcrete

C. Federal Specifications (FS):

1. TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces

D. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI - Manual of Standard Practice and Recommended Practice for Placing Reinforcing Bars (MSP-latest edition)

E. American Welding Society (AWS)

F. Scaffolding and Shoring Institute (SSI):

1. Scaffolding and Shoring Safety Rules

## 1.5 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
  1. Provide cement manufacturer's letter of certification and chemical content test results stating that the Portland cement is in compliance with ASTM designation C 150.
  2. Indicate amounts of mix water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material,

### CAST-IN-PLACE CONCRETE

grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
- F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
  - 1. Cementitious materials and aggregates.
  - 2. Steel reinforcement and reinforcement accessories.
  - 3. Admixtures.
  - 4. Curing materials.
  - 5. Floor and slab treatments.
  - 6. Bonding agents.
  - 7. Adhesives.
  - 8. Vapor retarders.
  - 9. Epoxy joint filler.
  - 10. Joint-filler strips.
  - 11. Repair materials.

#### 1.6 QUALITY ASSURANCE

- A. The contractor shall follow State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002 Section 502.0501. Class "A" concrete and Method "B" for quality control of concrete.
  - 1. No work under this section shall proceed until the QC plan is submitted to and approved by MDOT.
- B. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- C. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
  - 1. ACI 301, "Specification for Structural Concrete."
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

### PART 2 - PRODUCTS

#### CAST-IN-PLACE CONCRETE

MAINE DEPARTMENT OF TRANSPORTATION  
KITTELY SCALE-SOUTHBOUND  
KITTELY, MAINE

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## 2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  - 1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. High-density overlay, Class 1, or better.
    - b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.
    - c. Structural 1, B-B, or better, mill oiled and edge sealed.
    - d. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed.
  - 2. Manufactured forming system: metal or other panel system with prior review and approval.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of the exposed concrete surface.

## 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
  - 1. Bars shall be clean and free from rust, scale or coatings that will reduce bond. Reinforcing steel shall be capable of bending 180 degrees and rebending to original shape without fracture.
- B. Plain-Steel Wire: ASTM A 82, as drawn.

## 2.3 REINFORCEMENT ACCESSORIES

### CAST-IN-PLACE CONCRETE

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or fiber-reinforced concrete of greater compressive strength than concrete.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

## 2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
  - 1. Nominal Maximum Aggregate Size: 3/4 inch (19 mm).
- C. Water: Potable and complying with ASTM C 94.

## 2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260. Sika AER by the Sika Chemical Corp. or approved equal.
- C. Water-Reducing Admixture: ASTM C 494, Type A. Eucon W12-75 by the Euclid Chemical Corp. "Pozzolith 200N by Master Builders "Plastocrete 161" by the Sika Chemical Corp. or approved equal.
- D. Non-Corrosive Accelerator: ASTM C 494, Type C or E, Accelguard 80 by the Euclid Chemical Co. or "Polar Set" by W. R. Grace and Co. or approved equal.
  - a. Non -corrosive accelerator shall have long-term test data proving its non-corrosive effect on reinforcing steel.

## 2.6 VAPOR RETARDER SYSTEM (UNDER FLOOR SLABS)

- A. Vapor retarder shall be a minimum of 3 mil thickness of cross-laminated, high density polyethylene film. Vapor retarder shall be Vaporshield by Century Floors, Topsham, Maine, or approved equal, meeting the following properties:
  - 1. Tensile - ASTM D 882 (PSI): 7,000 psi min.
  - 2. Puncture - Fed. Std. 101 C (lb. force): 12.0 min.
  - 3. WVTR - ASTM E 96-A10.018 GM/100 in<sup>2</sup>/24 hr. max.

### CAST-IN-PLACE CONCRETE

- B. Vapor retarder tape shall be Vaporshield pressure sensitive tape with a tensile strength of 5000 psi min. in accordance with ASTM D 882, as manufactured by Century Floors, Topsham, Maine, or approved equal.
- C. Perimeter and penetration strip shall be double-faced adhesive edge strip 25 manufactured by Century Floors, Topsham, Maine, or approved equal.
- D. Perimeter isolation joint shall be 2 lb. density, crossed linked polyethylene with removable strip-off equal to Iso-Strip as manufactured for Century Floors, Topsham, Maine, or approved equal. FLOOR AND SLAB TREATMENTS.

A. CURING MATERIALS

- 1. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete. Evaporation retarder shall be "Con-film" by Master Builders or approved equal.
- 2. Water: Clean and Potable.
- 3. Curing Compound (Exterior Concrete Application): Conform to method of ASTM C 156 for compliance with ASTM C 309, non-coloring, non-staining, curing compound. Curing compound shall be SpecSeal AC 1315 as manufactured by ProSoCo, Inc. or approved equal.
- 4. Curing and Sealing Compound (Exposed Interior Concrete Slab Application): Conform to Federal Spec. TT-C-800A, 30 percent solids content minimum. Curing and sealing compound shall be "Super Floor Coat" by the Euclid Chemical Co., "Master-Seal" by Master Builders, or approved alternate. (Except areas to receive floor slab treatment.)
- 5. Waterproof Paper for Curing and Protection (Interior Non-Exposed Concrete): Conform to ASTM C 171, Type I. Paper shall be lapped and seams taped with reinforced tape, orange label Sisalcraft, Floor Cure Wet Strength by Glas-Kraft, Inc., or approved equal.

2.8 RELATED MATERIALS

- A. Perimeter Isolation Joint: 2 lb. density, cross linked polyethylene with removable strip-off equal to ISO-STRIP as manufactured for Century Floors, Topsham, Maine.
- B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- C. Deicer Protection (Exterior Concrete): Saltgard as manufactured by ProSoCo, Inc., or approved equal.
- D. Water and Oil Repellent: A clear penetrating silane compound with oil repellency additives. Water and oil repellent shall be Sure Klean Weather Seal SLX100 as manufactured by Pro So Co, Inc. or approved equal.
- E. Water stop: WATERSTOP-RX as manufactured by CETCO shall be used at all Scale pit floor to wall joints and at all construction joints.
- F. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

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- G. Epoxy-Bonding Adhesive: A two-component, solvent-free, moisture-insensitive structural epoxy adhesive in compliance with ASTM C 881, Type I and Type II, Grade 2, Class B and C, and shall be Sikadur 32, Hi-Mod by Sika Corp. or approved equal.
- H. Doweling Adhesive: A two-component, vinylester blend resin equal to HI HY150 adhesive as manufactured by Hilti Fastening Systems, Tulsa, Oklahoma or approved equal.
- I. Floor Control: Control joints shall be saw cut or 1/4" wide soft-cut.
- J. Construction Joints: See Drawing Details.
- K. Non-Shrink Grout: Premixed compound with non-metallic aggregate, cement, water-reducing and plasticizing agents capable of minimum compression strength of 2,400 lbs. Non-shrink grout shall be "Eucon N-S" (non-metallic) by the Euclid Chemical Co., "Masterflow 713" (non-metallic) by Master Builders, Five Star Grout by U.S. Grout Corp., or approved equal.

## 2.9 REPAIR MATERIALS

- A. Slurry: Slurry shall consist of the same proportions of cement to fine aggregates used in the regular concrete mix (coarse aggregate only omitted) and shall be well mixed with such amount of water as will produce a thick consistency.
- B. Dry Pack: Dry pack for cosmetic concrete repairs only shall consist of one part cement to 2-1/2 parts fine aggregate (screen out all materials retained on No. 4 sieve), mixed with a minimum amount of water, in small amounts. The consistency shall be such that when a ball of the mixture is compressed in the hand it will maintain its shape, showing finger marks, but without showing any surface water.
- C. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- D. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm).
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

### CAST-IN-PLACE CONCRETE



3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5700 psi (39 MPa) at 28 days when tested according to ASTM C 109/C 109M.

## 2.10 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

- C. Table for Working Stress Concrete:

USE	STRENGTH H 28 DAYS	MAXIMUM SIZE COARSE AGGREGATE	CEMENT MAXIMUM SLUMP AT PLACEMENT	WEIGHT OF CEMENT	TYPE OF CEMENT	WATER- CEMENT RATIO
Walls, Footings & Pads	3000#/sq. in.	3/4"	2"-4"	517#	II	0.53
Interior Slabs on Grade	3500#/sq. in.	3/4"	2"-4"	517#	II	0.53
Exterior Slabs on Grade, Sidewalks, & Related Work	4000#/sq. in.	3/4"	4"	611#	II	0.55

- D. All concrete shall contain the specified water-reducing admixture. All slabs placed below 50 degrees F shall contain the specified non-corrosive accelerator. All exterior concrete shall contain an approved air-entraining admixture.
- E. All exterior concrete shall have an air content of five percent to seven percent.
- F. All exterior concrete subjected to freezing and thawing shall have a maximum water-cement ratio of 0.53. All concrete subjected to deicers shall have a maximum water-cement ratio of 0.45.
- G. No air entrainment in interior floor slab.
- H. All mix design, batching, placing, finishing, curing, joint sealing and patching of color conditioned concrete shall be in strict accordance with the manufacturers recommendations

### CAST-IN-PLACE CONCRETE

- I. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.
- J. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
- K. Do not air entrain concrete to trowel-finished interior floors. Do not allow entrapped air content to exceed 3 percent.
- L. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- M. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

## 2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
- B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information (floor slabs only).

# PART 3 - EXECUTION

## 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
  - 1. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117. Excessive deflection of forms after concrete is poured shall be sufficient cause for rejection of that portion of concrete and formwork. Excessive deflection will be considered to be that which will produce visible and noticeable waves in the finished concrete.

### CAST-IN-PLACE CONCRETE

2. Construct forms so that walls will key into each other at ends unless poured monolithically.
- B. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8 inch (3 mm). (Exposed concrete)
  2. Class B, 1/4 inch (6 mm). (Non-exposed concrete)
- C. Construct forms tight enough to prevent loss of concrete mortar.
- D. All possible care shall be taken in the formwork to produce surfaces free from honeycomb or other defects.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Schedule the work and notify other trades in time so that provisions for their work in the formwork can be made without delaying progress of the project. Verify that all sleeves, pipes, etc., for electrical, plumbing, heating and ventilation, or other work are installed.
- H. Chamfer exterior corners and edges of permanently exposed concrete, where indicated on drawings.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Bolts, rods or other approved devices shall be used for internal ties. They shall be so arranged that when the forms are removed, no metal shall be within 1" of any surface.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

#### CAST-IN-PLACE CONCRETE

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Secure information about and provide for all openings, offsets, recessed nailing blocks, channel chases, anchors, ties, inserts, etc., in the formwork before concrete is poured.
  - 2. Install anchor bolts, accurately located, to elevations required.
    - a. The setting of all anchor bolts and the grouting for all structural steel base plates shall be included as part of this contract. Bolts and base plates will be furnished under Section 05500 - Metal Fabrications, and Section 13125 - Metal Building Systems.
    - b. All column base plates, equipment bases, and other locations noted in the structural drawings shall be grouted with the specified non-shrink grout. All exposed grout shall be the specified non-metallic type.

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

### 3.4 SHORES AND RESHORES

- A. Comply with ACI 318 (ACI 318M), ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

### 3.5 MOISTURE VAPOR RETARDER SYSTEM (UNDER FLOOR SLABS)

- A. Moisture vapor retarded system shall be installed at all interior floor slabs and as otherwise indicated in the drawings in strict accordance with the manufacturer=s printed instructions and as follows.
  - 1. Snap chalk line along inside perimeter of foundation walls at top of slab elevation.

#### CAST-IN-PLACE CONCRETE

2. Without wetting, clean a 3" wide band on the surface of the concrete below the chalk line at approximately mid-slab height. Remove dirt, residual form release, or other bond inhibiting surface contaminants. Grind smooth any surface projections within the band.
3. While removing the contact paper on the backside, firmly press 2" wide Vaporshield perimeter and penetration strip onto wall, parallel to the chalk line on the cleaned band at mid-slab elevation.
4. Remove contact paper on the face side.
5. Apply 12" wide Vaporshield edge roll covering only the bottom 1" of contact surface on the perimeter strip. Cut, fit, and seal corner details with Vaporshield seaming tape.
6. Align top edge of Iso-Strip isolation joint material to chalk line, and press material onto remaining 1" of exposed perimeter strip adhesive.
7. Roll out Vaporshield barrier material, overlapping edge rolls and all seams by 3". Tape all seams with Vaporshield seaming tape.
8. All tears, punctures, etc. to be repaired and taped as required to maintain the watertight integrity of the vapor barrier system.

### 3.6 STEEL REINFORCEMENT

#### A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. All steel bars and wire shall be of size, gauge and length indicated, accurately bent or formed to shapes detailed or scheduled by experienced shops using methods that will not injure the materials.
2. Steel reinforcing shall not be bent in a manner that will injure the material or the embedding concrete. Bars with kinks or bends not shown on the plans shall not be used. Heating of reinforcement for bending will not be permitted. Bars shall be bent once only (no rebending or straightening allowed) unless shown as such on the drawings.
3. All details of reinforcement not shown or indicated on the drawings or specifically called for in the specifications shall conform to ACI 315.
4. Lap all bars at splices, corners and intersections a minimum of 36 bar diameters unless otherwise indicated.
5. All intersecting concrete walls shall be tied with #4L bars 3'-0" long, bent 18" x 18" spaced 12" on center, outside face only unless otherwise indicated.
6. Splices of reinforcement shall not be made at points of maximum stress. Splice lengths shall be a minimum of 36 bar diameters unless otherwise indicated and shall provide sufficient lap to transfer the stress between bars by bond and shear. Stagger splices of adjacent bars where possible. All splices and laps at corners and intersections shall be tied with wire at each end.
7. Where obstructions (pipes, conduit, ducts, etc.) prevent the intended placement of reinforcing, provide additional reinforcing as directed by the Engineer or his Representative around the obstruction to match that reinforcing interrupted.
8. Provide additional stirrups, ties, trim bars, etc., as directed around all openings, sleeves, pipes, and conduits, which pass through structural elements.
9. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

#### CAST-IN-PLACE CONCRETE

- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Coverage of bars (including stirrups and column ties) shall, unless otherwise shown, be as follows:

Footings:	3" soil face, 2" top
Slabs (on grade):	2" soil face, 1-1/2" top face
Slabs (elevated):	1" top and bottom
Beam and Column (piers)	1-1/2"
Walls:	2" clear to form at exterior

2. Misplaced Reinforcing: If any reinforcing bars are found to be misplaced after concrete has been placed, the Engineer shall be notified immediately and no correction or cutting shall be made without his direction. Misplaced bars shall not be bent or kinked. Any redesign and/or reinforcing required because of misplaced bars shall be at the Contractor's expense.
3. All reinforcing shall be kept separate from soil, pipe, conduit ducts, etc., by approved non-metallic separators.
4. Reinforcement shall not have welded joints unless indicated on the drawings or unless prior approval has been given by the Engineer. Welding shall conform to the requirements of the American Welding Society Structural Welding Code for reinforcing steel D1.4. Field welding shall be performed by AWS certified welders.
5. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.

- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
2. Space vertical joints in walls as indicated.
- a. Wall control "V" joints shall have a depth of 1/8 times the thickness of the wall and be 1/2" wide at surface. "V" joints shall be placed as shown or as directed by the Engineer.

#### CAST-IN-PLACE CONCRETE

3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, or 3/4" minimum for soffit-cut as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/4" (maximum) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
    - a. Floor slab control joints shall be placed as shown on the foundation plan. Unless otherwise noted, control joints shall be spaced at intervals not to exceed 18'-0" on center in both directions.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, and other locations, as indicated.
1. Terminate full-width joint-filler strips not less than 1/2 inch (12 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
  2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. All intersecting slab construction joints acting as control joints shall be doweled according to the following schedule unless otherwise indicated. Dowels shall be smooth, steel grade 60 with saw cut ends. Grease, wrap or cap one end.

Dowel Schedule

	Dowel Dia.	Length	Spacing
5" Slab	5/8"	14"	12"
6" Slab	3/4"	14"	12"
8" Slab	1"	14"	12"

### 3.8 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

CAST-IN-PLACE CONCRETE

1. Remove all protrusions and indentations 2" or over in all areas.
2. Lay waterstop flat against concrete surface and nail every 1" to 6" with case hardened washers and nails.
3. Overlap all joints a minimum of 2".

### 3.9 MIXING CONCRETE

- A. General: The concrete shall be mixed in the quantities required for immediate use, and any which has developed initial set or exceed the time limit of ASTM C 94 shall not be used. No retempering of mortar or concrete shall be allowed under any circumstances. Concrete shall be proportioned, mixed and placed only in the presence of the Engineer or his Authorized Representative. The Contractor shall give ample notice to the Engineer before mixing is commenced. Aggregate size will be adjusted to suit conditions of work. Pumping of concrete shall be permitted only after approval by the Engineer of the Pumping Contractor and the pumping equipment and method to be employed. The Engineer shall be notified of dates when pumping of concrete shall be performed to permit his on-the-job inspection of the operations.
- B. Final proportions shall be in accordance with approved mix designs. Adjustments to approved proportions, for whatever reason, shall be approved by the Engineer.

### 3.10 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Remove loose dirt, mud, standing water, and foreign matter from excavations or from cavities.
- C. Thoroughly clean reinforcement and other embedded items free from loose rust and other matter. Assure reinforcing is held securely in place.
- D. Thoroughly wet wood forms (except coated plywood), bottom and sides of trenches, base underslab, and adjacent concrete or masonry at least one hour in advance of placing concrete; securely close cleanout and inspection ports; repeat wetting as necessary to keep forms damp.
- E. Equipment shall be maintained clean and of sufficient quantity and capacity to efficiently execute the work required.
- F. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Engineer.
- G. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- H. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

#### CAST-IN-PLACE CONCRETE



- I. Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
    - a. Concrete shall be vibrated into final position in forms with an internal type vibrating machine. The vibration shall have a frequency of not less than 8,000 vibrations per minute. The mechanical vibrating equipment shall be satisfactory to the Engineer.
    - b. The vibration shall be of sufficient intensity and duration to cause flow or settlement of the concrete and complete consolidation. Over vibration, especially of mixtures that are too wet, may cause segregation and will be avoided. A sufficient number of vibrators shall be provided to permit consolidation of each batch before the next batch is delivered and without delaying the delivery.
    - c. The vibrations shall be applied directly to the concrete, and vibration through the forms shall not be permitted. Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. The concrete shall be placed in layers of uniform thickness
  2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
  3. When conditions make puddling difficult, or where the reinforcement is congested, batches of mortar containing the same proportions of cement to sand used in the concrete shall be deposited in the forms. The operation of filling with the regularly specified mix shall be carried on at such a rate that the mix is at all times plastic and flows readily into the spaces between the bars.
  4. In thin walls or inaccessible portions of the forms where rodding is impractical, the concrete shall be worked into place by tapping or hammering forms adjacent to the freshly deposited concrete.
  5. The Contractor's attention is called to the importance of making the concrete dense, and he shall provide sufficient labor to the entire satisfaction of the Engineer to thoroughly consolidate the concrete, avoid air pockets and voids in exposed sections, and leave smooth, uniform surfaces after forms are removed.
  6. Should any honeycombed concrete be disclosed upon removal of forms, the Contractor shall immediately cut out the said honeycombed portions back to solid concrete and shall fill the opening thus formed with a concrete of the same proportions as that specified for the section of work in which the fault occurs.
  7. When placing fresh concrete upon hardened concrete, the latter shall be thoroughly roughened and cleaned of all loose material, scum or latency. The bonding compound shall be applied and the new concrete placed while the bonding compound is still tacky.

#### CAST-IN-PLACE CONCRETE

8. Joints in the concrete work shall be made only in places and the manner specified by the Engineer.
  9. The Contractor's attention is called to the importance of properly and carefully placing concrete around reinforcement, as the reinforcing metal must not be exposed; and in cases where reinforcing metal becomes exposed on the surface, that portion of work must be removed and re-laid as the covering of same by plastering with cement mortar will not be allowed. All reinforcing rods or other reinforcing material shall be lightly tapped so that they will retain their original position.
  10. No concrete shall be retempered except as allowed in ASTM C 94 nor shall set concrete be used as aggregate.
- J. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Maintain reinforcement in position on chairs during concrete placement.
    - a. Reinforcement, unless otherwise indicated, shall be placed one-half the thickness of the slab.
  3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  4. Slope surfaces uniformly to drains where required.
  5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
  6. Slabs shall be monolithically placed with control joints. Sawed control joints will be located as indicated on the drawings and/or as directed by the Engineer. Floors shall be cleaned of objects before saw cutting begins. A true, continuous saw cut is what is expected as a finish result.
- K. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
  2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
  4. Contractor shall have on the job, ready to install, adequate equipment for heating the materials and the freshly placed concrete and for enclosing the work in accordance with the requirements specified herein.

#### CAST-IN-PLACE CONCRETE

L. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

M. Protection:

1. Concrete just placed shall be protected from rain in an approved manner until the concrete has set, or if a slab, the curing compound has dried.
2. Concrete, when placed in the forms, shall have a temperature of not less than 50 degrees F nor more than 90 degrees F. Freshly placed concrete and the surrounding air shall be maintained at a temperature of 50 degrees F or greater for a period of seven days after placing. If high early strength concrete is used, the aforementioned time period may be reduced to three days. The methods of protection and curing shall be such as to prevent evaporation of moisture from the concrete and injury to the surface.
3. Should it later develop that any concrete work has become injured in any way by freezing or otherwise, the defective concrete shall be repaired or replaced as directed by the Engineer at no added expense to the Owner. Repair materials shall include all reinforcement grouts, dry pack, admixtures, epoxy and aggregates as may be necessary

N. Deicer Protection:

1. Apply deicer protection to all exterior slabs on grade, and related work 30 days after concrete placement in strict accordance with manufacturer's written recommendations.
2. Apply deicer protection to slab and walls in the scale pit.

### 3.11 PROTECTIVE COATING FOR STRUCTURAL STEEL

- A. All structural steel columns and their bases which extend into or through concrete floors shall be thoroughly brush painted with two coats of foundation coating as specified in Section 07150 - Dampproofing, and applied in accordance with the manufacturer's directions, neatly cut off one inch below finish floor.

### 3.12 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

#### CAST-IN-PLACE CONCRETE

- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm) in height.
  - 1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.13 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
  - 1. All interior concrete floor slabs shall be finished true and smooth by steel troweling or finishing machine. All exterior slabs shall be broom finished.
  - 2. When a section of the concrete floor is completed, it shall be left entirely undisturbed until the concrete is thoroughly hardened.
  - 3. Adequate provisions will be made to eliminate the possibility of accidental encroachment upon the newly concreted area.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish.
- C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view.
  - 2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
    - a. Tolerances will be in accordance with ACI Publication #117 - Class AX. Depression in floor between high spots shall not be greater than 3/16" in 10'-0"  $\pm$  1/16", and the measurement will be taken by the straight edge method no later than the day after the concrete floor has been poured.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms.

#### CAST-IN-PLACE CONCRETE

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

### 3.14 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Mechanical Equipment Pads: Provide 4" concrete pads reinforced with #3 Bars at 12" O.C. each way under all mechanical equipment supported on concrete floor slab unless otherwise indicated.
- C. Foundation Insulation: Install foundation insulation using a dab of emulsified asphalt mastic in each corner and the center to adhere the insulation to the concrete wall. Insulation will be installed on the inside face of all perimeter foundation walls extending from the underside of floor slab to top of footing. Insulation furnished under Section 07200 - Insulation.

### 3.15 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, and other surfaces as indicated below

#### 1. Interior:

- a. Exposed concrete slabs (excluding slabs scheduled to receive curing/sealer/hardener floor finish) shall receive the specified curing and sealing compound applied immediately following final finishing operations and in strict accordance with the manufacturer's recommendations.
- b. Concrete slabs scheduled to receive curing/sealer/hardener, shall be covered with specified curing paper and kept continuously moist for a period of at least seven (7) days after being deposited. Curing and sealing compounds are not to be used without Engineer's prior written approval.
- c. Slabs as indicated on the Room Finish Schedule shall receive the specified curing/sealer/hardener as follows:

#### CAST-IN-PLACE CONCRETE

- 1) Apply immediately following the final concrete finishing operation of the concrete floor slab and as soon as the concrete is firm enough to work on in strict accordance with the manufacturer's recommendations and written instructions.

2. Exterior:

- a. Concrete slabs, and related work shall receive the specified curing compound applied in strict accordance with the manufacturer's written recommendations.
- b. Concrete slabs, and related work shall receive the specified deicer protection 30 days after concrete placement in strict accordance with the manufacturer's written recommendations.

### 3.16 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  1. Defer joint filling until the completion of the project. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.
- D. Install isolation joints around columns in accordance with the drawings and manufacturer's recommendations.
- E. Install perimeter isolation joints in accordance with the drawings and manufacturer's recommendations.

### 3.17 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) in

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- depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  5. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  6. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

### 3.18 FIELD QUALITY CONTROL

#### CAST-IN-PLACE CONCRETE

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- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. A set of four (4) test cylinders shall be made for each 100 cubic yards, or fraction thereof, of each class of concrete placed each day. Cylinders shall be made and cured by the Testing Agency in accordance with ASTM C 31. The properly marked cylinders shall be picked up by the approved testing agency and tested in accordance with ASTM C 39. The test results will be sent directly to the Engineer with location and date marked. In addition to the date cast, the date and time the cylinders are picked up for transportation to the lab shall be shown.
  - 2. Description of the manner in which cylinders were stored for the first 24 hours and the succeeding 27 days shall also be indicated.
  - 3. Air temperature, as well as the concrete temperature, shall be shown so that there is adequate data to evaluate varying and possibly low test results.
  - 4. On-site slump tests will be made as directed:
    - a. Type II Cement: At placement maximum slump 4", minimum slump 2"
  - 5. Air content shall be checked at least twice each day on air-entrained concrete in accordance with ASTM C 173 or ASTM C 231.
  - 6. The owner shall pay for all tests.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- E. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to

#### CAST-IN-PLACE CONCRETE



determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer.

END OF SECTION

CAST-IN-PLACE CONCRETE

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KITTERY SCALE-SOUTHBOUND  
KITTERY, MAINE

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## SECTION 06100 – ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 WORK INCLUDED

- A. Furnish all labor, materials, equipment, supplies, and perform all operations necessary to complete the rough carpentry work in accordance with the drawings and specifications.
- B. The work includes, but is not limited to, the following:
  - 1. Framing, blocking, and strapping
  - 2. Plywood
  - 3. Rough hardware

#### 1.3 RELATED WORK

- A. Section 06170 - Prefabricated Structural Wood
- B. Section 06200 - Finish Carpentry
- C. Section 07200 - Insulation
- D. Section 07600 - Flashing and Sheet Metal
- E. Section 07900 - Sealants

#### 1.4 GRADING

- A. Conform to the American Standards "Simplified Practice Recommendations," R-16, latest edition.
- B. Plywood shall conform to the requirements of the American Softwood Product Standard PS 1-84.
- C. Lumber shall bear the grade and trademark of the association under whose rules it is produced.
- D. Plywood shall bear the grade, rating and trademark of the American Plywood Association (A.P.A.).
- E. Lumber shall be well seasoned and contain not more than 19 percent moisture content.

#### ROUGH CARPENTRY

- F. Lumber and plywood dimensions indicated or specified are nominal.

## 1.5 PROTECTION

- A. Lumber and plywood shall be protected, kept dry and blocked up off the ground.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Framing Lumber: No. 2 Grade or better kiln-dried spruce or Douglas fir unless specified or noted otherwise.
- B. Pressure Treated Lumber: No. 2 Grade or better kiln-dried southern yellow pine pressure treated with Wolman salts, minimum .40 pcf. All lumber in contact with masonry or concrete shall be pressure treated.
- C. Structural Grade Lumber: No. 2 or better kiln-dried eastern spruce unless specified or noted otherwise.
- D. Blocking, Strapping and Nailers: Kiln-dried D4S eastern spruce or Douglas fir (75 percent construction and 25 percent standard grades) unless specified or noted otherwise.
- E. Bridging and Bracing: No. 2 Grade or better kiln-dried eastern spruce or Douglas fir unless specified or noted otherwise.
- F. Plywood:
1. CDX Plywood: Douglas fir with exterior glue, thickness as indicated.
  2. AC Plywood: Douglas fir with exterior glue, thickness as indicated.
  3. Pressure Treated CDX Plywood: Douglas fir with exterior glue, pressure treated with waterborne preservatives for above ground exposure in accordance with AWWA Standard C9. All plywood in contact with masonry or concrete shall be pressure treated, thickness as indicated.
- G. Mounting Board, Electrical and Telephone Equipment: 3/4" C.D. interior grade plywood mounted with (powder-actuated fasteners) (expansion fasteners).
- H. Rough Hardware:
1. Furnish nails, spikes, bolts, anchors, screws, and nailing clips for the proper execution of this section.
  2. Rough hardware for exterior exposure and wall or roof sheathing shall be hot-dipped galvanized.
  3. Nails, common nails and steel spikes, shall be sized as follows:
    - a. 1" nominal thick stock.....8d
    - b. 2" nominal thick stock.....16d to 20d
    - c. 3" nominal thick stock.....40d to 60d
  4. Bolts: Minimum 5/8" diameter unless specified or noted otherwise. Provide washers under nuts over wood.
    - a. Fastening wood to wood - steel carriage bolts.
    - b. Fastening wood to steel - steel machine bolts.
    - c. Fastening wood to masonry - anchor or tie studs, through bolts where indicated.

#### ROUGH CARPENTRY

5. Lag Screws: Steel, size as indicated or required.

I. Fasteners:

1. Plywood to Wood Truss: Annular ring shank, round head, one-piece, composite nails. Penetrate 1" minimum into supporting wood.
2. Plywood to Metal: Minimum No. 8, length as recommended by the manufacturer, flat head, drill point screws, corrosion resistant. Rock-On by I.T.W. Buildex, Itasca, Illinois, or approved equal. Space at 6" on panel edge and 12" in panel field.

J. Epoxy Anchors: A307 standard carbon steel, zinc plated, chisel point, threaded rod, nut and washer, with ester-based resin adhesive, size as indicated. Rawl Chem-Stud by Rawlplug Inc., New Rochelle, New York, or approved equal.

K. Joist Hangers: Galvanized 14 gauge steel, sized for supported member. HU/HHU by Simpson Strong-Tie Co., San Leandro, California, or approved equal.

L. Top Bearing Joist Hangers: Galvanized 14 gauge steel, sized for supported member. Type HUSTF by Simpson Strong-Tie Co., San Leandro, California, or approved equal.

M. Framing Anchors: Galvanized 18 gauge steel. No. A35 by Simpson Strong-Tie Co., San Leandro, California, or approved equal.

N. Hurricane Ties: Galvanized 18 gauge steel. No. H2.5 as manufactured by Simpson Strong-Tie Co., San Leandro, California.

O. Building Wrap: High density polyethylene fiber sheet. Tyvek Housewrap by DuPont, Wilmington, Delaware, or approved equal.

P. Tape: #8086 Sheathing Tape by 3M Construction Division, St. Paul, Minnesota, or approved equal.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Rough carpentry shall be as shown on the drawings and specified; if not shown or specified, comply with the recommendations of the following:
1. National Forest Products Association - "Manual of House Framing."
  2. American Plywood Association - "Design/Construction Guide for Commercial and Residential."

#### 3.2 FRAMING

- A. Erect framing true to line, levels and dimensions. Framing shall be square, plumb, and aligned, and properly nailed and braced.
- B. Integrity of shear walls and/or rated wall assemblies to be maintained. Plywood and gypsum wall board to run continuously the length of designated walls. Intersecting walls are not to interrupt plywood or gypsum wallboard.

#### ROUGH CARPENTRY

- C. Verify size of all prefabricated units, including but not limited to, tubs and showers, before setting stud walls.

### 3.3 BLOCKING, NAILERS AND BRACING

- A. Mechanically fasten pressure treated wood blocking/knee walls to roof deck at roof perimeter and at all openings and projections. No blocking around vent stacks less than 18" diameter.
- B. Roof blocking shall be flush with surface to which roofing will be applied.
- C. Anchor blocking to resist 300 lbs./l.f. load in any direction.
- D. Nailers shall be minimum 1/2" wider than metal flanges to be attached.
- E. Blocking and nailer fastener heads shall be recessed.
- F. Provide blocking in furred and stud walls for wall attached items.
- G. Install framing anchors, joist hangers, and hurricane ties with recommended fasteners in accordance with the manufacturer's recommendations.
- H. Install epoxy anchors in accordance with the manufacturer's recommendations.
- I. Install wood truss bracing as indicated on the drawings and in accordance with the manufacturer's recommendations. Comply with the Truss Plate Institute's publication HIB, latest edition.

### 3.4 PLYWOOD

- A. Plywood Sheathing on Wood Framing (Exterior Walls) Nailing and fastening patterns as depicted on the drawings , Sheet S-000. Provide a 1/8" space between panels at all edges and end joints, unless otherwise recommended by the panel manufacturer.
- B. Install plywood underlayment in accordance with APA recommended installation and nailing requirements.
- C. Install plywood clips at roof sheathing panel midspan at each support.

### 3.5 BUILDING WRAP

- A. Building Paper: Install with 18" horizontal overlap. Fasten with 3/4" x 1/4" round stainless steel staples, L-11 BGA by Senco Products, Cincinnati, Ohio, or approved equal.
- B. Install on exterior side of construction.
- C. Tape all joints, rips, tears, breaks, ruptures, and protrusions with sheathing tape to provide a continuous seal and prevent leakage of cold air around protruding objects.
- D. Building wrap and tape application shall be in accordance with manufacturer's recommendations

#### ROUGH CARPENTRY

END OF SECTION 06100



## SECTION 06176 - METAL-PLATE-CONNECTED WOOD TRUSSES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes wood roof trusses and truss accessories.
- B. Related Sections include the following:
  - 1. Division 6 Section "Rough Carpentry" for roof sheathing and dimension lumber for supplementary framing and permanent bracing.

#### 1.3 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. NELMA - Northeastern Lumber Manufacturers Association.
  - 2. NLGA - National Lumber Grades Authority.
  - 3. SPIB - Southern Pine Inspection Bureau.
  - 4. WCLIB - West Coast Lumber Inspection Bureau.
  - 5. WWPA - Western Wood Products Association.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As indicated.
  - 2. Maximum Deflection Under Design Loads:
    - a. Roof Trusses: Vertical deflection of 1/240 of span.
    - b. Roof Trusses: Horizontal deflection at reactions of 1-1/4 inches.
- B. Structural Load Cases for Consideration in Design:
  - 1. Dead Load
  - 2. Dead Load + Snow Load (Uniform)
  - 3. Dead Load + Snow Load (Unbalanced Right Side)



4. Dead Load + Snow Load (Unbalanced Left Side)
5. Dead Load + Wind Load (Leeward Right Side)
6. Dead Load + Wind Load (Leeward Left Side)
7. Dead Load + (.75) Snow Load (Uniform) + (.75) Wind Load (Leeward Right Side)
8. Dead Load + (.75) Snow Load (Uniform) + (.75) Wind Load (Leeward Left Side)
9. Dead Load + (.75) Snow Load (Unbalanced Right Side) + (.75) Wind Load (Leeward Right Side)
10. Dead Load + (.75) Snow Load (Unbalanced Right Side) + (.75) Wind Load (Leeward Left Side)
11. Dead Load + (.75) Snow Load (Unbalanced Left Side) + (.75) Wind Load (Leeward Right Side)
12. Dead Load + (.75) Snow Load (Unbalanced Left Side) + (.75) Wind Load (Leeward Left Side)

## 1.5 SUBMITTALS

- A. Shop Drawings: Show location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber; splice details; type, size, material, finish, design values, orientation, and location of metal connector plates; and bearing details.
  1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.
- C. Qualification Data: For metal-plate manufacturer fabricator and Installer.
- D. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.
- E. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
  1. Metal-plate connectors.
  2. Metal framing anchors.

## 1.6 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality-control procedures for manufacture of connector plates published in TPI 1.
  1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that involves inspection by SPIB, Timber Products Inspection, TPI, or other independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.
- C. Source Limitations for Connector Plates: Obtain metal connector plates through one source from a single manufacturer.
- D. Comply with applicable requirements and recommendations of the following publications:
  - 1. TP1 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
  - 2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
  - 3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
- E. Wood Structural Design Standard: Comply with applicable requirements in AFPA's "National Design Specifications for Wood Construction" and its "Supplement."

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with TPI recommendations to avoid damage and lateral bending. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

#### 1.8 COORDINATION

- A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Metal Connector Plates:
    - a. Alpine Engineered Products, Inc.
    - b. CompuTrus, Inc.
    - c. Eagle Metal Products.
    - d. Jager Industries, Inc.
    - e. Mitek Industries, Inc.
    - f. Robbins Engineering, Inc.
    - g. TEE-LOK Corporation.
    - h. Truswal Systems Corporation.
  - 2. Metal Framing Anchors:
    - a. Alpine Engineered Products, Inc.

- b. Cleveland Steel Specialty Co.
- c. Harlen Metal Products, Inc.
- d. KC Metals Products, Inc.
- e. Silver Metal Products, Inc.
- f. Simpson Strong-Tie Company, Inc.
- g. Southeastern Metals Manufacturing Co., Inc.
- h. United Steel Products Company, Inc.

## 2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Provide dressed lumber, S4S, manufactured to actual sizes required by DOC PS 20 for moisture content specified.
  - 3. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Grade and Species: Provide visually graded dimension lumber for truss chord and web members, of the following grade and species:
  - 1. Grade for Chord Members: Select Structural or No. 1.
  - 2. Grade for Web Members: No. 2 or better.
  - 3. Species: Southern pine; SPIB.
  - 4. Species: Mixed southern pine; SPIB.

## 2.3 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates to comply with TPI 1 from metal complying with requirements indicated below:
- B. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, 80Z coating designation; ASTM A 570/ A 570M, Structural Steel (SS), Grade 33, and not less than 0.047 inch thick.

## 2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

## 2.5 METAL FRAMING ANCHORS

- A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
- C. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/2 inches wide by 0.062 inch thick. Tie fits over top of truss and fastens to both sides of truss, face of top plates, and side of stud below.
- D. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches wide by 0.050 inch thick. Clip is fastened to truss through slotted holes to allow for truss deflection.

## 2.6 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
  - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. Before installing, splice trusses delivered to Project site in more than one piece.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

- G. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
- J. Install wood trusses within installation tolerances in TPI 1.
- K. Do not cut or remove truss members.
- L. Replace wood trusses that are damaged or do not meet requirements. Do not alter trusses in field.

### 3.2 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.
  - 1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION

## SECTION 06182 – COMPOSITE LUMBER BEAMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail.
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 WORK INCLUDES

- A. Furnish all labor, materials, equipment, supplies, and perform all operations necessary to complete the composite lumber beam work in accordance with the drawings and specifications.
- B. The work includes, but is not limited to, the following:
  - 1. Laminated Veneer Lumber (L.V.L.)
  - 2. Parallel Stranded Lumber (P.S.L.).
  - 3. Hangers.

#### 1.3 RELATED WORK

- A. Section 05500 - Metal Fabrications
- B. Section 06100 - Rough Carpentry
- C. Section 06170 - Prefabricated Structural Wood
- D. Section 06195 - Prefabricated Wood Joists
- E. Section 06200 - Finish Carpentry

#### 1.4 SUBMITTALS

- A. Submit six (6) copies of shop drawings. Field verify all dimensions and obtain approval prior to fabrication.
- B. Show size, type, location, and placement of composite lumber and hangers and hanger nailing schedule.

#### 1.5 DELIVERY AND STORAGE

- A. Composite lumber beams shall be delivered, wrapped and protected from the weather. They shall be stored under cover in a protected place until installation.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

#### COMPOSITE LUMBER BEAMS

- A. Laminated Veneer Lumber: The L.V.L. shall be "Micro-Lam" and the P.S.L. shall be "Parallam" as manufactured by Trus Joist MacMillan, Boise, Idaho, or approved equal.
1. The composite lumber shall be designed and manufactured to comply with CABO Report No.'s NER-126 (L.V.L.) and NER 292 (P.S.L.).
  2. Veneers shall be Douglas fir or Southern Pine of thickness approved by the building code. They shall be ultrasonically graded or graded by other advanced grading systems approved by the code.
  3. Adhesives shall be of the waterproof type conforming to the requirements of ASTM D-2559.
  4. Structural Strength and Stiffness Properties:

	FLEXURAL STRESS (PSI)	SHEAR STRESS (PSI)	COMPRESSION PERPENDICULAR TO GRAIN (PSI)	MODULUS OF ELASTICITY (PSI)
Parallam PSL	3020	290	750	$2.0 \times 10^6$
MICRO=LAM LVL	3020	285	750	$2.0 \times 10^6$

## 2.2 FABRICATION

- A. P.S.L. shall be manufactured in a plant recognized by the BOCA National Building Code and under the supervision of an approved third party inspection agency. It shall be manufactured in a continuous process with all grains parallel with the length of the member. All members are to be free of finger joints or scarfs or mechanical connection in full length members.

## 2.3 IDENTIFICATION

- A. The composite lumber shall be identified by a stamp indicating the product type and grade, CABO NER report number, manufacturer's name, plant number, and the independent inspection agency's logo and evaluation report number.

## 2.4 HANGERS

- A. Hangers shall be 14 gauge galvanized steel manufactured by Simpson Strong-Tie Co., Inc. or approved equal as follows:
1. Parallam: Type and size required according to beam size, designed for a normal allowable load of 2,495 pounds.
  2. Micro-Lam: Type and size required according to beam size, designed for a normal allowable load of 640 pounds.
  3. Nails: Provide nails per the hanger manufacturer's nailing schedule and recommendations.

### COMPOSITE LUMBER BEAMS

## 2.5 CONSTRUCTION ADHESIVE

- A. Construction adhesive shall be heavy duty #CA3400 as manufactured by HILTI Corp., Tulsa, Oklahoma.

## PART 3 - EXECUTION

### 3.1 ERECTION AND INSTALLATION

- A. The composite lumber, if stored prior to erection, shall be protected from the weather. They shall be handled with care so they are not damaged. The composite lumber is to be erected and installed in accordance with the plans, shop drawings, and manufacturer's recommendations. Temporary construction loads, which cause stresses beyond design limits, are not permitted. Holes, cuts, or notches not previously approved by the Engineer or the Manufacturer's Engineer shall not be permitted. The final erection of the composite lumber shall be under the direction of a qualified construction supervisor.
- B. Connections: Lateral nail holding and withdrawal are as per the manufacturer's recommendations. The appearance of joints and the structure as a whole will not be impaired. When hoisting members into place, use padded or non-marring slings, and protect corners with wood blocking. Wrapping should be left intact until the members are enclosed within the structure. If wrapping has to be removed at certain connection points during erection, it should be replaced after the connection is made. If it is impractical to replace the wrapping, all of it should be removed. Brace members as they are erected to hold them in a safe position until full stability is provided.

### 3.2 WARRANTY

- A. The products delivered shall be free from manufacturing errors or defects in workmanship and material. The products shall perform to manufacturer's specification for the normal and expected life of the building.

END OF SECTION





## SECTION 06200 - FINISH CARPENTRY

### PART 1 - GENERAL

#### A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
2. Architectural Woodwork Institute's (AWI's) "Architectural Woodwork Quality Standards", latest edition.

#### B. SUMMARY

1. This Section includes the following:
  - a. Exterior standing and running trim including custom fabricated wood columns.
  - b. All interior standing and running trim and rails.
  - c. Interior shelving and casework not specified as part of kitchen or bath cabinetry.
2. Related Work specified elsewhere in this Project Manual:
  - a. Blocking and preparation of wood support structure for finish carpentry is specified in 06100 - Rough Carpentry.
  - b. Finishing of finish carpentry is specified in Section 09900 - Painting.
  - c. Factory fabricated cabinetry is specified in Division 12.

#### C. SUBMITTALS

1. Submit manufacturer's product data for all items specified.

#### D. DELIVERY, STORAGE, AND HANDLING

1. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels. Provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.
2. Do not deliver interior finish carpentry until environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified for installation areas.

#### E. PROJECT CONDITIONS

1. Environmental Conditions: Obtain and comply with finish carpentry manufacturer's and installer's coordinated advice for optimum temperature and humidity conditions for finish carpentry during its storage and installation.
2. Weather Conditions: Proceed with finish carpentry only when existing and forecasted weather conditions will permit exterior finish carpentry to be installed in compliance with manufacturer's recommendations and when substrate is completely dry.

### PART 2 - PRODUCTS

#### A. MATERIALS, GENERAL

## FINISH CARPENTRY

1. Lumber Standards: Comply with PS 20 "American Softwood Lumber Standard" for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.
2. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:
  - a. NELMA: New England Lumbermen's Association.
  - b. AWI: Architectural Woodwork Institute.
3. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
  - a. For exposed lumber furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

#### B. EXTERIOR STANDING AND RUNNING TRIM AND RAILS

1. Softwood Trim: Species and grade shall be No. 1 or Better, Pine or Poplar. Finger-jointed materials are NOT acceptable.
2. Panel Products: Provide Medium Density Overlay (MDO) plywood, marine grade, void free, 7-ply panel products for all exterior finish carpentry applications requiring face widths greater than 8 inches.
  - a. Exposed edges shall be banded with fir or filled and sanded smooth with exterior, high strength, waterproof, 2-part filler compound.
3. Preservative Wood Treatment by Pressure Process: Where lumber or plywood is indicated as preservative-treated wood or as specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.
  - a. Pressure-treat above ground items with water-borne preservatives to a minimum retention of 0.25 pcf. Treat indicated items and the following:
    - (1) All exterior trim including standing and running trim, and column wraps, wood rails and balusters
  - b. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

#### C. INTERIOR STANDING AND RUNNING TRIM AND RAILS

1. Trim and Rails: For trim and rails in form of boards and worked products, provide lumber complying with the following requirements.
  - a. Species: No. 2 Pine or Poplar: Paint Grade, finger-jointed materials are acceptable
  - b. Profiles: Provide profiles of trim and rails as indicated on Drawings.
2. Panel Products: Provide solid hardwood veneer panels, with 3/4 inch x thickness of panel nosings of same species to be applied to all exposed edges.

#### D. MISCELLANEOUS MATERIALS

1. Shelving Systems:

#### FINISH CARPENTRY

- a. Closet Shelf with Pole: vinyl coated wire shelving, rod and brackets system. Provide all supports and mounting hardware required for a finished installation.
2. Fasteners for Exterior Finish Carpentry: Stainless steel, noncorrosive aluminum or hot-dip galvanized nails, in sufficient length to penetrate minimum of 1-1/2 inches into substrate unless recommended otherwise by manufacturer.
  - a. Countersink nails and fill surface where face nailing is unavoidable.
3. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
  - a. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
  - b. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153.

#### E. FABRICATION

1. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry in relation to relative humidity conditions existing during time of fabrication and in installation areas. Provide finish carpentry with moisture content that is compatible with Project requirements.
2. Fabricate finish carpentry to dimensions, profiles and details indicated. Ease edges to radius indicated for the following:
  - a. Lumber less than 1 inch in nominal thickness: 1/16 inch.
  - b. Lumber 1 inch or more in nominal thickness: 1/8 inch.
3. Fabricate Utility Shelving to comply with AWI Section 600, Custom Grade.

### PART 3 - EXECUTION

#### A. EXAMINATION

1. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### B. PREPARATION

1. Clean substrates of projections and substances detrimental to application.
2. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation for a minimum of 24 hours unless longer conditioning recommended by manufacturer.

#### C. INSTALLATION, GENERAL

1. Do not use finish carpentry materials that are unsound, warped, bowed, twisted, improperly treated or finished, not adequately seasoned, or too small to fabricate with proper jointing arrangements.
2. Do not use manufactured units with defective surfaces, sizes, or patterns.
3. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.

#### FINISH CARPENTRY

4. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
5. Install to tolerance of 1/8 inch in 8 feet for plumb and level. Install adjoining finish carpentry with 1/16 inch maximum offset for flush installation and 1/8 inch maximum offset for reveal installation.
6. Coordinate finish carpentry with materials and systems that may be in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.
7. Finish in accordance with specified requirements.

#### D. STANDING AND RUNNING TRIM AND RAILS

1. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related standing and running trim and rails. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane back of casings to provide uniform thickness across joints if required.
2. Install trim after drywall joint finishing operations are completed.
3. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

#### E. ADJUSTING

1. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

#### F. CLEANING

1. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

#### G. PROTECTION

1. Provide final protection and maintain conditions that ensure finish carpentry is without damage or deterioration at time of Substantial Completion.

END OF SECTION

#### FINISH CARPENTRY

## SECTION 07150 – DAMPPROOFING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 WORK INCLUDES

- A. Furnish all labor and materials necessary to complete all dampproofing work as herein specified, as indicated on the drawings or both.

#### 1.3 RELATED WORK

- A. Section 02200 - Earthwork
- B. Section 03001 - Concrete

#### 1.4 SUBMITTALS

- A. Submit six (6) copies of manufacturer's product data to include the recommended application of each product used.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Protect emulsified asphalt against freezing while in transit or storage.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS:

- A. Asphalt Primer shall be as recommended by emulsified asphalt coating manufacturer.
- B. Emulsified Asphalt (Foundation Dampproofing and Structural Coating Below Grade): Cold-Applied, Asphalt Emulsion Dampproofing: Asphalt-based emulsions recommended by the manufacturer for dampproofing use when applied according to the manufacturer's instructions.
  - 1. Trowel Grade: Emulsified asphalt mastic, prepared with mineral-colloid emulsifying agents suitable for application in a relatively thick film, complying with ASTM D 1187, Type 1.
    - a. Sealmastic, Type 3; W. R. Meadows
    - b. Hydrocide 600; Sonneborn Building Products
    - c. Dampproofing Asphalt Coatings Mastic; Euclid
    - d. Karnak 920; Karnac Chemical Corp.
  - 2. Semimastic Grade: Emulsified asphalt mastic, prepared with mineral-colloid emulsifying agents and containing fibers other than asbestos, complying with ASTM D 1227, Type 3 or 4.

#### DAMPPROOFING

- a. Sealmastic, Type 2; W. R. Meadows
  - b. Hydrocide 700; Sonneborn Building Products
  - c. Dampproofing Asphalt Coatings Semimastic; Euclid
  - d. Karnak 220; Karnac Chemical Corp.
3. Spray Grade: Emulsified asphalt mastic, prepared with mineral-colloid emulsifying agents without fibrous reinforcement, complying with ASTM D 1227, Type 3.
- a. Sealmastic, Type 1; W. R. Meadows
  - b. Hydrocide 700B; Sonneborn Building Products
  - c. Karnak 100; Karnac Chemical Corp.

### PART 3 - EXECUTION

#### 3.1 FOUNDATION DAMPPROOFING

- A. Dampproof the earth backfilled side of all exterior foundation walls (not specified or indicated to receive membrane waterproofing) where interior concrete slab elevations are below finished exterior grade, the backfilled side of all interior foundation walls where the floor slabs are at different elevations on each side of the wall, and as otherwise indicated on the drawings.
- B. The surface must be clean and free of all foreign matter. Do not apply over a frost-covered surface. All cracks, form tie holes, voids, honeycombs, etc., shall be filled and repaired with mortar to provide a sound structural surface.
- C. All surfaces to be dampproofed shall be structurally sound and clean. Dirt and mud should be hosed off; oil and grease shall be removed with recommended solvents.
- D. Never apply emulsified asphalt at temperatures below 40 degrees.
- E. Treat thoroughly dry, old surfaces with high penetration asphalt primer and allow to dry thoroughly (one (1) day minimum).
- F. Prime green concrete with a solution of emulsified asphalt diluted with one (1) part water to four (4) parts emulsion, and allow to dry before putting on the finish coat.
- G. Trowel asphalt on the surfaces to be dampproofed in a continuous unbroken film free from pinholes and other surface breaks. Apply two (2) coats at a rate of 2 to 3 gallons per 100 sq. ft. per coat.
- H. Neatly cut asphalt off 6" below finish grade and carry asphalt down the face of the wall and over the tops and edges of footings. Work thoroughly into all grooves and joints.

#### 3.2 STRUCTURAL COATING

- A. Protect all steel embedded in gravel with a liberal coat of troweled emulsified asphalt mastic.

END OF SECTION

#### DAMPPROOFING

## SECTION 07311 – ROOFING

### PART 1 - GENERAL

#### A. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
2. Section 06100, Rough Carpentry.

#### B. SUMMARY

1. This Section includes:
  - a. Asphalt shingles.
  - b. Ridge vents.
  - c. Flashing and trim.
  - d. Single-ply self-adhering roofing underlayment membrane.

#### C. SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
  - a. Product data for each type of product specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.
  - b. Samples for initial selection purposes in form of manufacturer's sample finishes showing full range of colors and profiles available.

#### D. QUALITY ASSURANCE

1. Fire Performance Characteristics: Provide products that are identical to those tested for the specified fire performance characteristics by U. L. or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

#### E. DELIVERY, STORAGE, AND HANDLING

1. Deliver materials to Project site in manufacturer's unopened bundles or containers with labels intact.
2. Handle and store materials at Project site to prevent water damage, staining, or other physical damage. Store roll goods on end. Comply with manufacturer's recommendations for job site storage, handling, and protection.

#### F. PROJECT CONDITIONS

1. Weather Conditions: Proceed with Work only when existing and forecasted weather conditions will permit Work to be installed in compliance with manufacturer's recommendations and when substrate is completely dry.

#### G. WARRANTY

1. Special Project Warranty: Submit a written warranty, executed by manufacturer, agreeing to repair or replace asphalt shingles that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, deforma-

## ROOFING



tion or deterioration of shingles beyond normal weathering. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

- a. Asphalt Shingles: Warranty period is 40 years after date of Substantial Completion.

## PART 2 - PRODUCTS

### A. MANUFACTURERS

1. Asphalt Shingles: Subject to compliance with requirements, manufacturers offering asphalt and fiberglass composite shingles that may be incorporated in the Work include, but are not limited to, the following:
  - a. Celotex Corporation.
  - b. CertainTeed Corporation.
  - c. GAF Building Materials Corporation.
  - d. IKO Industries, Inc.
  - e. Bird Inc.

### B. ASPHALT SHINGLES

1. Square-Tab Strip Shingles: U. L. Class "A," 235 lb., minimum weight mineral surfaced, self-sealing, three-tab asphalt and fiberglass composite, strip shingles complying with ASTM D 3018, bearing UL Class "A" external fire exposure label, U. L. 997 - 110 MPH wind rating label, and 40 year limited warranty.
  - a. Basis of Design: CertainTeed "Hatteras" from The Roofing Collection.
2. Hip and Ridge Shingles: Manufacturer's standard factory precut units to match shingles.
3. Colors, Blends and Patterns: Provide manufacturer's standard asphalt shingle products with the following requirements:
  - a. Provide selection made by Architect from manufacturer's full range of standard colors, textures, and patterns for asphalt shingles of type indicated.

### C. ACCESSORIES

1. Felt Underlayment: 15-pound, unperforated organic felt complying with ASTM D 226, Type I; 36 inches wide.
2. Membrane Waterproofing: Polyethylene-sheet-backed rubberized asphalt membrane, 40 mils thick. Provide primer when recommended by underlayment manufacturer.
  - a. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
    - (1) "Bituthene Ice & Water Shield," W.R. Grace & Co.
    - (2) "Polyken 640 Underlayment Membrane," Polyken Technologies.
3. Asphalt Plastic Cement: Nonasbestos fibrated asphalt cement complying with ASTM D 4586, designed for trowel application.
4. Nails: Aluminum or hot-dip galvanized steel, 11- or 12-gage, sharp-pointed, conventional roofing nails with barbed shanks, minimum 3/8 inch diameter head, and of sufficient length to penetrate 3/4 inch into solid decking or to penetrate through plywood sheathing. Material of nails in contact with flashing shall match materials selected for flashing to prevent galvanic action.

## ROOFING

- a. Pneumatically or manually drive nails without damaging shingle. Comply with manufacturer's nailing requirements for warranty compliance.
5. Metal Drip Edge: Minimum 0.024-inch mill finish aluminum sheet, pre-manufactured standard shape to provide 3-inch roof deck flange and 1 1/2 inch fascia flange with 3/8 inch drip at lower edge. Furnish in lengths of 8 or 10 feet.
6. Metal Flashing: 0.024-inch mill finish sheet aluminum, job-cut to sizes and configurations required
7. Vent Pipe Flashing: One-piece elastomeric, self sealing flashing, sized to vent pipe diameter.
8. Ridge Vents: Provide low profile ridge vents with a minimum net area of 17 sq. in per linear ft., constructed to receive asphalt roofing shingles, designed to keep out insects and to prevent weather infiltration.
  - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ridge vent products that may be incorporated in the work include, but are not limited to, the following:
    - (1) Airhawk: "Shingle Over".
    - (2) Air Vent: "Shinglevent II".
9. Aluminum Gutter and Downspout System: Provide complete standard, factory finished aluminum 6 inch gutter and rectangular 2" x 3" downspout system for roof edges indicated in Drawings and as follows:
  - a. Available Manufacturers: Subject to compliance with requirements, manufacturers gutter system products that may be incorporated in the work include, but are not limited to, the following:
    - (1) Alcoa Aluminum, as available from Applicator Sales & Service, Inc. or approved equal; complete with hangers, bands, end caps, fittings, fasteners, and sealant.

### PART 3 - EXECUTION

#### A.EXAMINATION

1. Examine substrate for compliance with requirements for substrates, installation tolerances, and other conditions affecting performance of Work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### B.PREPARATION

1. Clean substrates of projections and substances detrimental to application. Cover knot-holes or other minor voids in substrate with sheet metal flashing secured with noncorrosive roofing nails.
2. Coordinate installation with flashings and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roof sheathing have been installed and are securely fastened against movement.

#### C.INSTALLATION

1. Asphalt Shingles:

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- a. Comply with manufacturer's installation instructions and recommendations, but not less than recommended by "The NRCA Steep Roofing Manual."
  - b. Felt Underlayment: Apply one layer of felt underlayment horizontally over entire surface to receive asphalt shingles, lapping succeeding courses a minimum of 2 inches, end laps a minimum of 4 inches, and hips and valleys a minimum of 6 inches. Fasten felt with sufficient number of roofing nails or noncorrosive staples to hold underlayment in place until asphalt shingle application.
  - c. Omit felt underlayment at areas of perimeter membrane underlayment. Lap felt underlayment over perimeter underlayment as recommended by manufacturer but not less than 2 inches.
  - d. Membrane Waterproofing: Apply waterproofing membrane as indicated:
    - (1) 6 feet at all eaves and roof edges.
    - (2) 9 feet at all valleys.
    - (3) 18 inches each way at all roof/wall junctions.
    - (4) At all roof penetrations under metal flashing.
  - e. Install asphalt shingles beginning at lower end with a starter strip of roll roofing or inverted shingles with tabs removed. Fasten shingles with weather exposure, and using number of fasteners per shingle as recommended by manufacturer. Use vertical and horizontal chalk lines to ensure straight coursing.
  - f. Cut and fit asphalt shingles at ridges and edges to provide maximum weather protection. Provide same weather exposure at ridges as specified for roof. Lap shingles at ridges to shed water away from direction of prevailing wind. Fasteners at ridges shall be of sufficient length to penetrate sheathing or ridge-vent caps as specified.
  - g. Install adequate venting free area to comply with Local Codes and warranty requirements of the roof shingle manufacturer.
2. Flashing: Install metal flashing as indicated and in accordance with details and recommendations of the "Asphalt Roofing" section of "The NRCA Steep Roofing Manual."
  3. Install flashing at roof junctions as required ensuring a watertight seal. Comply with recommendations of manufacturer's of asphalt shingles.
  4. Replace any damaged materials installed under this Section with new materials meeting specified requirements.
  5. Provide final protection and maintain conditions that ensure roof assemblies remain without damage or deterioration at time of Substantial Completion, in a manner suitable to Installer.

END OF SECTION

#### ROOFING

## SECTION 08111 - STANDARD STEEL DOORS AND FRAMES

### PART 1. - GENERAL

#### A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### B. SUMMARY

1. This Section includes the following products:
  - a. Doors: Flush steel doors for interior and exterior locations.
  - b. Frames: Steel frames for all doors, transoms, sidelights, mullions, interior glazed panels, and other interior and exterior openings:
2. Assemblies: Provide standard steel door and frame assemblies as required for the following:
  - a. Insulated flush exterior, glazed and unglazed.
  - b. Standard interior flush, glazed and unglazed.
  - c. Labeled and fire rated.
3. Related Work specified elsewhere in this Project Manual:
  - a. Blocking and preparation of wood support structure for door frames is specified in 06100 – Rough Carpentry.
  - b. Finishing doors and frames is specified in Section 09900 – Painting.
  - c. Door Hardware is specified in Section 08710 – Door Hardware.

#### C. SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
2. Product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
3. Shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
4. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
5. Indicate coordinate of glazing frames and stops with glass and glazing requirements.
6. Label Construction Certification: For door assemblies required to be fire-rated and exceeding limitations of labeled assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

## STANDARD STEEL DOORS AND FRAMES

#### D. QUALITY ASSURANCE

1. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100 and as herein specified.
2. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies whose fire resistance characteristics have been determined per ASTM E 152 and which are labeled and listed by UL, Factory Mutual, Warnock Hershey, or other testing and inspecting organization acceptable to authorities having jurisdiction.

#### E. DELIVERY, STORAGE, AND HANDLING

1. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
2. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
3. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inches spaces between stacked doors to promote air circulation.

### PART 2. - PRODUCTS

#### A. FLUSH DOORS

##### 1. ACCEPTABLE MANUFACTURERS

- a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

- (1) Standard Steel Doors:
  - (a) Ceco Corp. - Imperial
  - (b) Curries Company. - 707N
  - (c) Steelcraft Manufacturing Co.- Model LF-18

##### 2. Fabrication:

- a. Type: Full Flush - 1-3/4" thick with 18 gauge steel skins.
- b. Core to be one of the following:
  - (1) Impregnated honey-comb
  - (2) Internal formed steel members welded to face panels and sound deadened.
  - (3) Rigid slab of polystyrene foam bonded to face skins. Required for all doors indicated to be insulated.
- c. Top and Bottom Stiffeners: Inverted 14-gauge, cold rolled steel channels welded within the door.

##### 3. Hardware reinforcing gauges:

- |             |       |
|-------------|-------|
| a. Hardware | Gauge |
| (1) Hinges  | 10    |

#### STANDARD STEEL DOORS AND FRAMES

- (2) Lock & Latches 14
- (3) Surface and Flush Bolts 14
- (4) Surface Applied Door Closers 12
- (5) Overhead Stops and Holders 12
- (6) Pull plates, Push Plates and Bars- Exit Devices 14 box
- 4. Bevels: Lock edge shall be beveled 1/8" in 2".
- 5. Shop Applied Paint: Apply after fabrication.
- 6. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints complying with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."
  - a. Exterior Doors: Additional requirements for exterior doors shall include Galvanizing in accordance with ASTM A525, minimum .670 oz./sg.ft.
- 7. Provide metal doors of types and styles or grades and models indicated on Drawings or schedules.
- 8. Door Louvers: Provide sightproof stationary louvers for interior doors where indicated, constructed of inverted V-shaped or Y-shaped blades formed of 24-gage cold-rolled steel set into minimum 20-gage steel frame.

#### B. FRAMES:

- 1. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules.
- 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include; but are not limited to, the following:
  - a. Ceco Corp.
  - b. Curries Company.
  - c. Steelcraft Manufacturing Co.
- 3. Type: 16 gauge welded
- 4. Anchors: Appropriate for walls; masonry tee type; drywall slip-in or welded type. Provide a minimum of three anchors each jamb in addition to 18 gauge floor anchor.
- 5. Hardware preparation: Prepare for scheduled hardware. No unnecessary cutouts allowed. Reinforce for hinges and Closers - minimum 12 gauge.
- 6. Labeled frames shall bear UL Label.
- 7. Additional requirements for exterior frames:
  - a. Galvanized: ASTM A525, minimum .670 oz./sg.ft.
  - b. Provide 3/4" high rabbets and stops where insulating glass occurs.
  - c. Conceal fastenings, unless otherwise indicated.
  - d. Form exterior frames from 16-gage galvanized steel.
- 8. Door Silencers: Except on weather-stripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

#### C. FABRICATION

- 1. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's

#### STANDARD STEEL DOORS AND FRAMES

plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements.

2. Clearances: Not more than 1/8 inch at jambs and heads except between non-fire-rated pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.
3. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
4. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

### PART 3. - EXECUTION

#### A. INSTALLATION

1. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
2. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames," unless otherwise indicated.
3. Except for frames located at existing concrete, masonry or drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
4. In masonry construction, locate 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry Tee anchors.
5. Install fire-rated frames in accordance with NFPA Standard No. 80.
6. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In closed steel stud partitions, attach wall anchors to studs with screws.
7. Knock down slip-on drywall frames will not be acceptable.
8. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-100.
9. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.

#### B. ADJUST AND CLEAN

1. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
2. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.
3. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

### STANDARD STEEL DOORS AND FRAMES

END OF SECTION





## SECTION 08360 - SECTIONAL OVERHEAD DOORS

### PART 1 - GENERAL

#### A. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### B. SUMMARY

1. This Section includes sectional overhead doors, as follows:
  - a. Manually operated upward acting sectional door with insulated steel sandwich panels.

#### C. SUBMITTALS

1. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
2. Product data, roughing-in diagrams, and installation instructions for each type and size of overhead door. Include manufacturer's operating instructions and maintenance data.
3. Shop drawings for special components and installations that are not fully dimensioned or detailed in manufacturer's data.

#### D. QUALITY ASSURANCE

1. Manufacturer Qualifications: Provide each sectional overhead door as a complete unit produced by a single manufacturer, including frames, sections, brackets, guides, tracks, counterbalance mechanisms, hardware, operators, and installation accessories.
2. Inserts and Anchorages: Furnish inserts and anchoring devices that must be set in concrete or built into masonry for unit installation. Provide setting drawings, templates, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.
  - a. See concrete Specification Section for instruction on installing inserts and anchorage devices.
3. Wind Loading: Design and reinforce sectional overhead doors to withstand a 20-psf wind-loading pressure.
4. Insulation: Provide rigid foam

### PART 2 - PRODUCTS

#### A. ACCEPTABLE MANUFACTURERS

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - a. Overhead Door Corp.
  - b. Raynor Garage Door Co.
  - c. Wayne/Dalton Corp.
  - d. Windsor Door

#### SECTIONAL OVERHEAD DOORS

## B.DOOR SECTIONS

1. Type: Two inch thick panels faced with roll-formed, hot-dipped galvanized steel sheet.
2. Section Joint: Panels shall have continuous horizontal interlocking joints formed in the panel edges in a weathertight tongue-and-groove profile designed to receive weatherstripping for air-tight seal.
3. Materials:
  - a. Face sheets: 24 gauge hot-dipped galvanized steel exterior face sheet and 27 gauge (min.) interior face primed and factory finished with manufacturer's standard interior color..
  - b. Insulation: Panels shall be solid core, injected with full thickness polyurethane foam insulation providing an R-value of not less than 16.
  - c. End Caps: Door section end caps shall be formed of 16 gauge hot-dipped galvanized steel, permanently bonded to panels and sealed.
  - d. Finish exterior face of door with manufacturer's standard thermosetting polyester topcoat paint system. Color to be as selected by Owner from full range available.

## C.TRACKS, SUPPORTS, AND ACCESSORIES

1. Tracks: Provide manufacturer's standard, galvanized-steel track system, sized for door size and weight, and designed for clearances shown. Provide complete track assembly including brackets, bracing and reinforcing for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track at 2 inches o.c. for door-drop safety device. Slope tracks at proper angle from vertical, or otherwise design to ensure tight closure at jambs when door unit is closed. Weld or bolt to track supports.
2. Track Reinforcement and Supports: Provide galvanized-steel track reinforcement and support members. Secure, reinforce and support tracks as required for size and weight of door to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
  - a. Support and attach tracks to opening jambs with continuous angle welded to tracks and attached to wall. Support horizontal (ceiling tracks) with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve and end of tracks.
3. Weather Seals: Provide continuous rubber, neoprene, or flexible vinyl adjustable weatherstrip gasket at tops and compressible astragal on bottoms of each overhead door.
  - a. In addition, provide continuous flexible seals at door jamb edges for a fully weathertight installation.
4. Lock cylinder is specified in another Division 8 Section.

## D.HARDWARE

1. General: Provide heavy-duty, rust-resistant hardware, with galvanized or cadmium-plated or stainless steel fasteners, to suit type of door.
2. Hinges: Provide 14 gauge galvanized steel hinges and brackets at each reinforced mounting point on door face, per manufacturer's recommendations for size of door. Attach hinges to door sections through reinforced mounting points with bolts and lock

### SECTIONAL OVERHEAD DOORS

nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible.

3. Rollers: Provide heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide roller tires to suit size of track (3-inch diameter for 3-inch track; 2-inch diameter for 2-inch track) and as follows:
  - a. Case-hardened steel tires for normal installations.
4. Pull Handles, Locks and Latches: For manually operated doors, furnish lifting handles, locks, and locking device as follows:
5. Lifting Handles: Galvanized steel.
6. Locking Bars: Single side, operable from inside and outside.
  - a. Fabricate locking device assembly with mortise lock, spring-loaded dead bolt, chromium-plated operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
  - b. Lock cylinder is specified in another Division 8 Section.

#### E. COUNTERBALANCING MECHANISM

1. Extension Spring: Operation by extension-spring counterbalance mechanism with aircraft-type steel cable over ball-bearing sheaves. Provide oil-tempered, wired springs with internal safety rods. Combine operation with a spring bumper in each horizontal track to cushion door at end of opening operation.
2. Torsion Spring: Operation by torsion-spring counterbalance mechanism, consisting of adjustable-tension, helically wound, tempered-steel torsion springs mounted on a cross header tube or steel shaft. Connect to door with galvanized aircraft-type lift cables. Provide springs calibrated for 25,000 cycles minimum.
  - a. Provide cast-aluminum or grey-iron casting cable drums, grooved to receive cable. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft. Provide one additional midpoint bracket for shafts up to 16 feet long and two additional brackets at one-third points to support shafts over 16 feet long, unless closer spacing recommended by door manufacturer.
  - b. Include a spring-loaded, steel or bronze cam mounted to bottom door roller assembly on each side, designed to automatically stop door if either cable breaks.
  - c. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

### PART 3 - EXECUTION

#### A. INSTALLATION

1. General: Install door, track, and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports according to shop drawings, manufacturer's instructions, and as specified.
  - a. Fasten vertical track assembly to framing at not less than 24 inches o.c. Hang horizontal track from structural overhead framing with angle or channel hangers, welded and bolt-fastened in place. Provide sway bracing, diagonal

#### SECTIONAL OVERHEAD DOORS

bracing, and reinforcing as required for rigid installation of track and door-operating equipment.

- b. After completing installation, including work by other trades, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

END OF SECTION

#### SECTIONAL OVERHEAD DOORS

MAINE DEPARTMENT OF TRANSPORTATION  
KITTERY SCALE - SOUTHBOUND  
KITTERY, MAINE

08360-4

## SECTION 08575 - FIBERGLASS WINDOWS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Fiberglass gliders, and related stationary windows complete with hardware, glazing, weather-strip, insect screen, and standard or specified anchors, trim, attachments, and accessories.

#### 1.3 RELATED SECTIONS

- A. Section 01330-Submittal Procedures: Shop Drawings, Product Data, and Samples.
- B. Section 01400- Quality Requirements.
- C. Section 01770- Closeout Procedures.
- D. Section 06200- Finish Carpentry: Wood trim other than furnished by window manufacturer.
- E. Section 07901 - Joint Sealants: Sill sealant and perimeter caulking.
- F. Section 09900 - Painting: Paint or stain other than factory applied finish.

#### 1.4 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. E 283: Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
  - 2. E 330: Standard Test Method for Structural Performance of Exterior Windows, Curtains Walls, and Doors by Uniform Static Air Pressure Difference.
  - 3. E 547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
  - 4. E 774: Specification for Sealed Insulated Glass Units.
  - 5. C 1036: Standard Specification for Flat Glass.
- B. American Architectural Manufacturers Association / Window and Door Manufacturers Association (AAMA / WDMA): 101 / I.S.2-97: Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
- C. Window and Door Manufacturers Association (WDMA): 101 / I.S.2-97 WDMA Hallmark Certification Program.
- D. Sealed Insulating Glass Manufacturers Association Canada/ Insulating Glass Certification Council (IGMAC / IGCC).
- E. American Architectural Manufacturers Association (AAMA): AAMA 613-98 Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles.
- F. National Fenestration Rating Council (NFRC): 100-97: Procedure for Determining Fenestration Product Thermal Properties.

### FIBERGLASS WINDOWS

## 1.5 SYSTEM DESCRIPTION

### A. Design and Performance Requirements:

1. Window Units shall be designed to comply with AAMA / WDMA 101 I.S.2-97
  - a. Glider: HS-LC30 up to 72 x 60 frame size.
  - b. Picture/Transom and Fixed: F-LC30 up to 72 x 72
2. Air leakage of fixed units shall not exceed the following when tested at H-R30 - 1.57 according to ASTM E 283: H-R30 - 0.30 cfm per square foot of frame. Air leakage of gliders shall not exceed the following when tested at HS-R30: HS-R30 - 0.30 cfm per square foot of frame.
3. No water penetration shall occur when units are tested at the following pressure according to ASTM E 547: H-R30 and HS-R30 - 4.5 psf.
4. Window assembly shall withstand the following positive or negative uniform static air pressure difference without damage when tested according to ASTM E 330: H-R30 and HS-R30 - 45 psf.

## 1.6 SUBMITTALS

- A. Shop Drawings: Submit shop drawings under provisions of Section 01330.
- B. Product Data: Submit catalog data under provisions of Section 01330.
- C. Samples:
  1. Submit corner section under provisions of Section 01330.
  2. Include glazing system, quality of construction, and specified finish.
- D. Quality Control Submittals: Submit manufacturer's certifications indicating compliance with specified performance and design requirements under provisions of Section 01330.

## 1.7 QUALITY ASSURANCE

- A. Provide all units and window types manufactured by a single manufacturer and purchased from one source.

## 1.8 DELIVERY

- A. Deliver all window units undamaged, individually wrapped in original packaging, and protect from weather.

## 1.9 STORAGE AND HANDLING

- A. Store window units in an upright position in a clean and dry storage area above ground and protect from weather and all potential damage.

## 1.10 WARRANTY

- A. Windows shall be warranted to be free from defects in manufacturing, materials, and workmanship for a period of ten (10) years from purchase date.
- B. Insulating glass shall be warranted against visible obstruction thru the glass caused by a failure of the insulating glass air seal for a period of twenty (20) years from the date of original purchase.

### FIBERGLASS WINDOWS

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering factory assembled fiberglass Double Hung and Glider windows and related stationary units with insulating glass, which may be incorporated in the Work include, but are not limited to the following:
1. Infinity Windows & Doors, Fargo, North Dakota ( a Division of Marvin Windows)
  2. Soverign Windows, by Inline Fiberglass Ltd., Toronto, Ontario
  3. Fibertec Window and Door Manufacturing, Concord, Ontario
  4. Comfort Line, Inc. Toledo, OH

### 2.2 MATERIALS

- A. Frame: Fiberglass reinforced plastic Exterior and Interior 0.075 inch (2 mm) thick. Frame thickness: 7/8 inch (22 mm) head jamb, 7/8 inch (22 mm) composite side jamb, 25/32 inches (20 mm) sill, Flat bottom sill with 8 degree bevel. Frame width: 2-7/8 inches (73 mm).
- B. Sash: Fiberglass reinforced plastic Exterior and Interior 0.075 inch (2mm) thick. Composite sash thickness: 1-3/8 inches (35 mm) for operating units. Sash exterior Fiberglass reinforced plastic, 0.080 inch (2 mm) thick. Operable sash tilt to interior for cleaning or removal.
- C. Glazing: Select quality complying with ASTM C 1036. Insulating glass IGCC certified to performance level CBA when tested in accordance with ASTM E 774.
1. Glazing method: Insulating glass
  2. Glass type: Low E II with Argon gas Tempered
  3. Glazing seal: Silicone bedding on interior; silicone bedding on exterior.
- D. Finish:
1. Exterior: Impermeable co-extruded acrylic finish on fiberglass reinforced plastic.
    - a. Color: White.
  2. Interior: Co-extruded acrylic finish on fiberglass reinforced plastic.
    - a. Color: White.
- E. Hardware:
1. Lock: High pressure zinc die-cast cam lock and keeper. Finish: Phosphate coated and electrostatically painted white baked enamel.
  2. Pull: High pressure zinc die-cast. Finish: Phosphate coated and electrostatically painted white baked enamel.
- F. Weatherstripping:
1. Glider Units are weatherstripped with a foam type material for added long term performance to seal against both the operating and stationary sash top rails and the operating sash bottom rail. The stationary meeting rail has a weatherstrip interlock to seal against the operating meeting stile. The operating and stationary stiles seal against a weatherstrip on the jamb parting stop.
    - a. Color: White.

#### FIBERGLASS WINDOWS



3. Stationary units: Continuous foam weatherstrip at perimeter of sash.

a. Color: Gray.

G. Insect Screens: Factory installed half screen. Screen cloth, 18 by 16 mesh: Charcoal fiberglass.

1. Frame color: White.

## 2.3 ACCESSORIES AND TRIM

### A. Installation Accessories:

1. Package of installation hardware consisting of:

- a. Nine #8 x 2" Torx trusshead installation screws - White
- b. One sash pull
- c. Two sash pull hole plugs
- f. Two #7 x 3/4" Phillips flathead screws (for sash pull) - White

2. Picture /Transom package of installation hardware consisting of:

- a. Twelve #8x2" Torx trusshead installation screws.

3. Sill Installation Filler

- a. 108" length

4. Jamb Extension, installation, and Mulling Accessories:

- a. Interior Frame Cover
- b. Jamb extension adapter
- c. 5/8" sheetrock receiver
- d. Pre-finished jamb extension material
- e. Nailing fin
- f. Nailing fin drip cap
- g. Nailing fin corner gaskets
- h. Exterior mull cover
- i. Mulling pin
- j. Interior mull clip and cover
- k. Head jamb mull bracket
- l. Mull tape – 1 sided

5. Aluminum Extrusions:

- a. Profile: Frame expander or Coil panning as necessary and/or as indicated on Drawings.
- b. Finish: High solids polyester. Color: White.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Before installation, verify openings are plumb, square, and of proper dimension as required. Report frame defects or unsuitable conditions to the General Contractor before proceeding.

#### FIBERGLASS WINDOWS

- B. Acceptance of Conditions: Beginning of installation confirms acceptance of existing conditions.

### 3.2 INSTALLATION

- A. Assemble and install window unit according to manufacture's instructions and reviewed shop drawings.
- B. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07920 Joint Sealants. Do not use expansive foam sealant.
- C. Install accessory items as required.

### 3.3 CLEANING

- A. Remove visible labels and adhesive residue from glass according to manufacture's instructions.
- B. Leave windows and glass in a clean condition. Perform final cleaning as required in Section 01770.

### 3.4 PROTECTING INSTALLED CONSTRUCTION

- A. Protect windows from damage by chemicals, solvents, paint, or other construction operations that may cause damage until Project is accepted by Owner.

END OF SECTION



## SECTION 08710 - DOOR HARDWARE

### PART 1. - GENERAL

#### A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### B. SUMMARY

1. This Section includes items known commercially as finish or door hardware that are required for doors, except special types of unique hardware specified in the same Sections as the doors and door frames on which they are installed.
2. Related work specified elsewhere in these Specifications are as follows:
  - a. Section 06200 - Finish Carpentry
  - b. Section 08111 - Standard Steel Doors and Frames

#### C. SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.
2. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
3. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware. Based on hardware indicated, organize schedule into "hardware sets" using Architect's door and hardware set numbers, indicating complete designations of every item required for each door or opening.
4. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

#### D. QUALITY ASSURANCE

1. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.
2. Supplier is to meet with Owner to finalize keying requirements and to submit these requirements in writing to the Architect.
3. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction.

#### E. MAINTENANCE

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

### PART 2. - PRODUCTS

#### DOOR HARDWARE

#### A. MANUFACTURERS

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the listed manufacturers.

#### B. SCHEDULED HARDWARE

1. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:
  - a. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.
  - b. ANSI/BHMA designations used elsewhere in this Section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this Section.
    - (1) Standards for door and frame preparation ANSI A115
    - (2) Standards for finish hardware ANSI A156
    - (3) Standards for fire doors and windows
    - (4) Standards for accessibility ANSI A117

#### C. MATERIALS AND FABRICATION

1. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
  - a. Manufacturer's identification will be permitted on rim of lock cylinders only.
2. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.
3. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
  - a. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
  - b. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of re-

#### DOOR HARDWARE

reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

#### D. HINGES & BUTTS

1. Templates: provide only template-produced units.
  - a. Screws: Provide Phillips flat-head screws complying with the following requirements:
  - b. For metal doors and frames install machine screws into drilled and tapped holes.
  - c. For wood doors install wood screws.
  - d. For fire-rated wood doors install #12 x 1-1/4-inch, threaded- to-the-head steel wood screws.
  - e. Finish screw heads to match surface of hinges or pivots.
2. The following is a guide for hinge size (height) and type required for this specification.
  - a. For 1 3/4" doors up to 3' 0" wide:

Exterior	Interior		
	Stanley	FBB191-4 1/2"	FBB179-4 1/2"
	Hager	BB1191-4 1/2"	BB1279-4 1/2"
	McKinney	TA-TB2314-4 1/2"	TA-TB2714 - 4 1/2"
  - b. For 1 3/4" doors over 3' 0" wide:

	Stanley	FBB199-4 1/2"	FBB168-4 1/2"
	Hager	BB1199-4 1/2"	BB1168-4 1/2"
	McKinney	T4A-T4B3386-4 1/2"	T4A-T4B3786-4 1/2"
  - c. The width of hinges shall be sufficient to clear all trim.
3. Two hinges shall be provided for each door up to and including five feet in height. An additional hinge shall be required for each additional two and one half feet or fraction thereof in height.
4. Spring Hinges for Gate: Provide one Standard weight, square corner, full-mortise spring hinge for the interior gate in 4" x 4" equal to Hager 1250 for use in conjunction with standard ball-bearing hinge to provide self-closing feature for gate. Hinge shall be fully adjustable for spring tension.

#### E. KEYING

1. Review the keying system with the Owner and their grand master key system.
2. Equip locks with manufacturer's standard 6-pin tumbler, removable core cylinders at all hardware requiring key access. Provide cylinders and cores compatible with Owner's existing keying system.
3. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
4. Comply with Owner's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
5. Key Material: Provide keys of nickel silver only.
6. Key Quantity: Review with Owner quantities required and furnish as directed.

#### DOOR HARDWARE

7. Deliver keys to Owner.

#### F. MORTISE LEVER HANDLE LOCKSETS

1. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated. ANSI Standard A115.1, 4 7/8" x 1 1/4".
2. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
3. Flush Bolt Heads: Minimum of 1/2-inch-diameter rods of brass, bronze, or stainless steel with minimum 12-inch-long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.
4. Provide sets equivalent to the following:
  - a. Schlage L9000 Series 02A/ Design - cast or forged.
  - b. Sargent 8100 Series LNW Design - cast or forged
  - c. Corbin L9500 Match design specified for Sargent or Schlage.

The following is a list of functions as indicated under "Hardware Sets":

Function	Corbin	Sargent	Schlage
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A	57	04	80
---	----	----	----

storeroom -outside lever fixed - key only entrance, inside lever always unlocked

C	10	15	10
---	----	----	----

Passage set - both levers always unlocked.

E	54	16	60
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vestibule lock - inside lever always unlocked, outside is lockable by key from both sides.

F	20	65	40
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Privacy lock - inside lever has push button lock. Can be opened from outside by small screw driver, turning inside lever releases push button.

#### G. MORTISE DEADLOCKS

1. Provide 2-3/4" backset mortise deadlocks having a heavy gauge wrought steel case. The cast size shall be no less than 3-3/4" x 2-3/4" x 1" with a bronze adjustable lock front 1-1/8" x 4-5/8" (bevel adjustment 1/8" in 2").
2. The deadbolt shall be 1 inch throw, cast or extruded bronze.
3. The following manufacturers and model numbers will be acceptable:
  - a. Sargent - 4800 series
  - b. Schlage - L9000 series
  - c. Corbin - 420 series
  - d. Russwin - 1500 series
4. The following function is required for all deadbolts - Classroom Deadbolt lock: deadbolt thrown or retracted by key outside, inside turn unit will retract bolt only.

#### H. DOOR CLOSERS

##### DOOR HARDWARE

1. Rack and Pinion type, with cast iron cases and full cover. Closers to be non-handed type and nonsized with adjustable back-check effective at 70 degrees for both standard and parallel arm mounting. Door closure size shall be approximately 12" - 14" x 2" x 2 3/8" projection.
2. Closers shall be the equivalent of:
  - a. Corbin K120 - K121
  - b. LCN 1460-72G - 1461-72G
  - c. Russwin K2820 - K2821
  - d. Sargent 1250 - 1251
3. Provide drop brackets if necessary.
4. All door closers for use on labeled doors shall be listed by Underwriters Laboratories for the use on self closing fire rated doors.

#### I. EXIT DEVICES

1. All exit devices for this project shall be equal to the 80 series exit device as manufactured by Sargent and Company.
  - a. Horizontal mounting rail - stainless steel 14 gauge
  - b. Touch pad - 16 gauge stainless steel with Lexan touch pad protection plate.
  - c. Chassis - solid cast non-ferrous alloy or pressure formed almag mounted directly to door with f4 screws or through bolted where required for positive attachment.
  - d. Mounting - chassis, end cap, and horizontal mounting rail shall be mounted directly to and flush with the door surface. No gaps or space shall be permitted between the back of the horizontal mounting rail and the door surface. If required a continuous solid stainless steel spacer bar shall be used to fill the space between the back of the device and the door surface.
  - e. Chassis cover - 16 gauge cold formed stainless steel
  - f. Rail Assembly - 14 gauge stainless steel; case shall be 16 gauge stainless steel with a Lexan touch pad protection plate.
  - g. End Caps- shall be high impact resistant black lexan fastened to the rail assembly.
  - h. The touch pad shall retract the latchbolt by means of a sliding motion of the touch pad toward the lock stile, activation the lever arm for easy operation and reduced friction.
  - i. All exit devices regardless of function shall have one point cylinder dogging. The cylinder for cylinder dogging shall be a six pin cylinder keyed to the building masterkey system.
  - j. Trim for exit devices shall be one of the following - pull handles as specified or for all fire rated doors cast stainless steel lever handles with cast escutcheons.
2. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use.
3. Devices for fire rated doors shall be listed by Underwriters Laboratories for up to 3 hour, A-label doors but not less than the required rating as indicated. All fire exit devices required to be installed on fire rated doors shall carry a supplementary label bearing the marking: "Fire Doors to be Equipped with Fire Exit Hardware."

#### DOOR HARDWARE



4. At pairs of doors and Single Non-rated Doors: Provide rim type locking. Locking style to be equal to Sargent Function 13.

J. SILENCERS

1. Provide rubber silencers for all interior pressed steel frames. Silencers shall be pneumatic type 1/2" diameter with 1/8" projection.
2. Provide 3 silencers for the strike jamb of metal frames for single doors and two for the head for metal frames for pairs of doors.

K. KICK, PUSH, MOP AND ARMOR PLATES

1. Plates to be .505 gauge solid stainless steel.
2. Push plates: 16" x 8"
3. Kick plates: 8" x door width less 2"

L. PULLS

1. Pulls for doors shall be 1" diameter solid round bar, 10" center to center, with a projection of 2-1/2", and a clearance of 1-1/2".
2. Pulls shall be fastened with thru-bolts, one at each base.
3. At exit devices locate pull below the cylinder.

M. DOOR STOPS

1. Stops: Provide door stops at ALL doors whether equipped with a closer or not with the only exception being exterior, out-swinging doors.
  - a. Wall type bumpers with a concealed type flange which shall be used wherever possible and shall be equivalent to Ives 407 1/2.
  - b. Dome floor type stops shall be Ives 436 or 438.
2. Where called for Stop With Holder, stop shall be provided with a Holder – equal to Ives 452.

N. HARDWARE FINISHES

1. Exit devices , push bars, pulls - US32D
2. Door Closers - Sprayed Aluminum
3. All hardware not specifically noted otherwise - US26D dull chrome finish.

O. SADDLES AND WEATHER-STRIPPING

1. Saddles: equal to No. 813 by National Guard Products, Inc.
2. Weatherstripping: Provide at all exterior hollow metal doors and frames, continuous concealed fastener seal system with extruded mill-finish aluminum receiver and cover with silicone-based foam gaskets. Seals for the head and jambs of openings shall be National Guard Products, Inc.'s No. 170SA or approved equal by Zero International, Pemko, etc.
3. Automatic Door Bottoms: Provide at all exterior hollow metal doors and frames and where scheduled, a full-width, fully recessed, adjustable automatic door bottom sill-seal system with silicone seals and extruded aluminum housing.

DOOR HARDWARE

- a. Unit shall be reversible and trimmable up to 4 inches.
- b. Drop shall be adjustable and be up to ½" total closure.
- c. Unit shall fit ¾ inch high x 1-1/2 inch recess and be National Guard Products, Inc.'s No. 320S or approved equal by Zero International, Pemko, etc.

### PART 3. - EXECUTION

#### A. INSTALLATION

1. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Engineer.
  - a. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
  - b. "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.
  - c. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."
2. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
3. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
4. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
5. Weather-stripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

#### B. ADJUSTING, CLEANING, AND DEMONSTRATING

1. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
2. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
  - a. Clean adjacent surfaces soiled by hardware installation.
3. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

### PART 4. - HARDWARE SCHEDULE

#### DOOR HARDWARE

A. GENERAL

1. Provide hardware for each door to comply with requirements of Section "Door Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.
2. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.
3. Refer to the Drawings for indication of required ratings for doors and frames.

B. SCHEDULE:

SET        HARDWARE

- 1 Mortise Lockset (Function E), 1 1/2 pair hinges, closer, weather-stripping, door bottom, kickplate, threshold.
- 2 Mortise lockset (Function F), 1 1/2 pair hinges, stop, kick plate.
- 3 Latchset (Function C without trim on public side of gate), 1 pair hinges (one spring hinge), stop, kickplate.
- 4 Exit Device, 1 1/2 pair hinges, closer, weather-stripping, door bottom, kickplate, push-plate, pull, threshold, lock cylinders.
- 5 Latchset (Function C), 1 1/2 pair hinges, stop, soundseals, door bottom.
- 6 Mortise lockset (Function F), 1 1/2 pair hinges, closer, kickplate.
- 7 Lock cylinder (For overhead door).
- 8 Mortise lockset (Function A), 1 1/2 pair hinges, stop, kick plate.

END OF SECTION

DOOR HARDWARE

## SECTION 11161 – TRUCK SCALES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Truck Scale.
  - 2. Scale Pit.
  - 3. Scale instrumentation.
  - 4. Traffic lighting.
  - 5. Installation.
  - 6. Maintenance agreement.
  - 7. warranty
- B. Related Sections include the following:
  - 1. Division 2 Section "Storm Drain Piping" for scale pit drains.
  - 2. Division 3 Section "Cast-in-Place Concrete" for concrete work for recessed loading dock equipment.
  - 3. Division 5 Section "Metal Fabrications" for installing Steel channel frame at edges of Scale deck and to provide and install steel form deck and studs for scale deck.
  - 4. Division 16 Section "power wiring" for electrical power wiring.

#### 1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, rated capacities, operating characteristics, furnished specialties, accessories, and dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, details, and attachments to other work.
  - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 2. Wiring Diagrams: Power, signal, and control wiring.

- C. Qualification Data: For Installer.
- D. Maintenance Data: For truck scales and related instrumentation equipment to include maintenance manuals.
- E. Warranties: Special warranties specified in this Section.
- F. Maintenance Agreement: Special maintenance agreement as required for Special warranties and as specified in this section.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
  - 1. Maintenance Proximity: Not more than four (4) hours' normal travel time from Installer's place of business to Project site.
- B. Source Limitations: Obtain scale and related instrumentation equipment through one source from a single manufacturer.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle scale and instrumentation in a manner to avoid any damage.

#### 1.6 COORDINATION

- A. Coordinate installation of anchorages for equipment. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Recessed truck scale Equipment: Coordinate size and location of pits to ensure proper clearances and operation of equipment.
  - 1. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- C. Electrical Requirements: Coordinate wiring requirements and current characteristics of truck scale and instrumentation equipment with building electrical system. See Division 16 Sections.

## 1.7 WARRANTY

- A. Special Warranty for Truck scales: Manufacturer's standard form in which manufacturer agrees to repair or replace scale and instrumentation components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Structural failures including cracked or broken structural support members and load-bearing welds.
- b. Load cell and RC cell failures including cables and cable connections.
- c. Balance box assembly failures including cables and cable connections.
- d. Related instrumentation failures including cables and cable connections.
- e. Failures of all Instrumentation including load cells due to lightning, or surge voltage.

2. Warranty Period for the all components: three (3) years from date of Substantial Completion.

## 1.8 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 twelve months' full maintenance by skilled employees of truck scale equipment manufacturer. Include semiannual preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper equipment operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.

- B. Continuing Maintenance Service: Provide a continuing full maintenance program from Manufacturer to Owner, in the form of a two (2) year maintenance agreement, starting on date the initial maintenance service is concluded. Include semiannual preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper equipment operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Basis-of-Design Product: The design for the Truck scale equipment is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

- a. Fairbanks
- b. Mettler Toledo

## 2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.
- B. Steel Tubing: ASTM A 500, cold formed.
- C. Welding procedures: Select according to AWS D1.1-88 Structural welding code.

## 2.3 ELECTRONIC PIT TYPE TRUCK SCALE

- A. General: Fully electronic pit-type Rocker Column, Multi platform Static Weigh scale designed for installation in concrete pit with channel iron edged reinforced concrete decks, and electronic instrumentation, all of type, function, operation, capacity, size, and construction indicated; and complete with all controls, safety devices, and accessories required. All components and accessories shall be supplied from one manufacturer. The electronic weigh equipment and all components and accessories shall conform to the requirements for commercial scales as outlined by the National Institute of Standards and Technology (NIST) Handbook 44. A certificate of conformance under the National Type Evaluation Program (NTEP) shall be provided.

- B. Basis-of-Design Product: Fairbanks 2600 series fully electronic 50' + 20' + 10' x 10' 75 ton capacity 70,000 lb DTAC highway system truck scale.

1. The scale shall consist of three (3) individual platforms with reinforced concrete decks. The 3 platforms shall be in tandem with the 50' x 10' platform being the first section that the vehicle drives over, then a 20' x 10' section for the rear axels of the tractor and the 10' x 10' section or the steering axle in front of the scale operators window to allow the scale operator to communicate with the driver.

2. The scale shall have (4) four 24" manholes and frames one in each section and one additional in the 50' section.

3. The weighbridge shall be of I-beam design

4. All structural steel and concrete deck copings shall be painted as specified.

- a. Both internal and external steel surfaces shall be carefully cleaned to commercial sandblast (SP6) specifications and protected with two (2) coats of epoxy ester finish applied to a minimum of 3 mil thickness per coat.

- 1) Primer shall be equal to 14-R-862 red Epoxy Ester Primer.
- 2) Finish Coat shall be equal to 12-G-428 Red Epoxy Modified Enamel.
- 3) All load cell base plates shall receive the same paint as the weighbridge.

5. All welding on the structure shall be either Submerged or shielded arc or gas to metal process in accordance with AWS D1.1-88 structural welding code.
6. The scale shall completely self checking.
  - a. No check rods shall be used.
  - b. The scale shall not use the load cells as a checking devise.
7. Load cells shall be manufactured of stainless steel and shall be hermetically sealed with a moisture protection to IP 68/NEMA 6P standards.
  - a. The design shall permit the individual load cells to be matched and the scale sections to be electronically calibrated.
  - b. Loads shall be applied to load cells without the use of links, cables or flexures.
  - c. Each load cell shall have a minimum capacity of 65,000 pounds.
    - 1) Each load cell cable shall have a stainless steel braded covering.
8. Electrical junction boxes located out side the scale house shall be a minimum of a NEMA 4X rating unless otherwise specified.
9. The scale shall have a self diagnostic capability able to identify load cell failures and problems.
  - a. The diagnostics shall be capable of predicting the failure of a cell prior to the actual failure. The diagnostics shall measure the cell counts not weight to determine the reliability of each load cell.
  - b. In the event of a load cell failure the instrumentation shall identify the specific load cell that has failed.
  - c. All diagnostics trouble shooting shall be done from with in the scale house.

C. Electronic instrumentation equal to Fairbanks IND R2500-F2 instrument:

1. This instrumentation shall include all equipment required for the weighing, recording and printing of all operations as described herein.
2. Tie each load cell directly to the microprocessor or through a sectional Controller. A digital load cell ID shall be automatically assign to each load cell.
3. A digital signal shall be sent through a serial bus line to the Micro computer based digital instrument.
4. The instrumentation shall have a minimum of 64 K of memory but must have sufficient memory to function with out errors.
5. The display shall be a fully graphic display and shall be alphanumeric LCD, LED backlit with the capability to prompt the operator through all operations with alpha characters.
6. A self diagnostics programming shall be built into the instrumentation that allows the technician to view all load cells simultaneously, showing the cell # the calibration and the counts for each cell.
7. The system shall allow 100% calibration form the scale house.
8. The system shall be capable of being programmed in pounds or kilograms and shall be installed to operate in the pounds mode.
9. Surge voltage protection shall be provided for all instrumentation.



10. Provide a comprehensive lightening protection system as required so the manufactures warranty will cover all failures that occur due to lightening or surge voltages during the warranty period.

D. Accessories:

1. Provide and install (4) - 5.5" LED remote displays. One for each individual platform weight and one for the total weight.
2. Provide and install a 12" traffic light, manual switch and 8' pole equal to Fairbanks part # 12707bsd.
3. Provide a Overload Warning system equal to "Fireball" warning light and audible alarm system.
4. Provide two (2) additional ( spare).load cells

E. System Hardware:

1. The system controller shall include a 100% IBM compatible computer. Acceptable manufactures are IBM, Hewlett Packard, Compaq, or Dell with a minimum of the following features:
  - a. 2.5 GHz Pentium class processor.
  - b. 512 MB of ram memory.
  - c. 60 GB hard drive.
  - d. Mid tower case.
  - e. 32X CD Rom drive.
  - f. 3 1/2" diskette drive.
  - g. Windows XP Operating system
  - h. 101 key board
  - i. Surge Protection
  - j. Back up system incase of hard drive failure, complete with licensed backup software.
  - k. 2 serial ports, 1 parallel port, and 4 USB ports
  - l. Internal 56K modem.
  - m. 17" SVGA monitor.
2. Uninterrupted power supply (UPS)meeting the following requirements:
  - a. The backup system shall be capable of running the computer (scale instrumentation) for 30 minutes.
  - b. Overload capacity of at least 150% for surge and 125% for 10 minutes on line, 150% surge and 110% for 10 minutes on inverter.
  - c. Protected by a power surge suppressor
  - d. UL safety certificate.
  - e. Serial port connection and related software to shut down the computer prior to the battery discharge.
3. 1 printer equal to HP 3030 Laser All – in – One Machine capable of 15 PPM black print speed, flat bed scanner, built in fax with a 7000 page per month duty cycle.

F. System Firm ware and Software:

1. The system firm ware and software shall be customized software designed for Department of Transportation / State Police Multi platform Static weigh scale. The software shall be compatible with any IBM compatible computer and capable of:
  - a. Classifying, weighing, recording and data storage.
  - b. Collecting data on axle and gross weights, vehicle classification (based on number of axles and axle spacing).
  - c. Recall all total overweight vehicles in the last 90 days.
  - d. The system shall be capable of printing weigh slips showing axle weight and gross weight.
  - e. Showing time and date.
  - f. The capacity and ability to store data on a per vehicle bases with a capacity to store a minimum of 90 days of transactions, and to save the data files of transactions to a file and or diskette.
  - g. Report generators and writers with the capability to search by a specific ID, date, violation or any specific printed part of the transaction.
  - h. The instrumentation shall have the capacity to run multiple platforms as a standard unit with out the need to add extra circuit boards and or software

#### 2.4 SCALE PIT AND PLATFORM:

- A. Provide scaled sealed pit/foundation and platform drawings showing all necessary layouts required for installation, including all reinforcing steel, anchor bolts, inserts, etc.
  1. Drawings shall be prepared and sealed by an Engineer licensed in the State of Maine.
- B. Provide all material, labor and equipment to install the concrete pit/ foundation and platform as required and following the requirements in section 03300 Cast in place Concrete.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine roughing-in for electrical systems for equipment to verify actual locations of connections before equipment installation.
- B. Examine walls and floors of pits for suitable conditions where recessed equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage.
- C. Check for scale pit ground rods as required for proper grounding and or lightening protection.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordinate size and location of equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation.
- B. Set deck channels in concrete edges of scale platform.
- C. Set pit end angles in concrete edges at both ends of the pit with tops flush with approach. Install angle in one piece sections with welded stud anchors.
- D. Clean pit of debris.

### 3.3 INSTALLATION

- A. General: Install Scale equipment, including pit, scale platform, control stations wiring safety devices and accessories as required for a complete installation. Installation and setup of all Scale equipment shall be conducted by equipment manufactures technicians.
  - 1. Provide Owner a set of installation drawings and directions on site for use by the engineer and the owners representative/ clerk
  - 2. Coordinate layout of pit excavation. Excavation is specified under division 2 Common excavation, embankment and compaction.
  - 3. Assist in setting of required batter boards and or controls for the proper location of the scale pit.
  - 4. Install reinforced concrete pit in accordance with manufacturer provided shop drawings. Provide all required bond outs, inserts, anchor bolts, etc. as required for a complete installation of the scale and related controls.
  - 5. Coordinate the backfill of the scale pit upon required set time of the concrete as specified in section 03300 Cast in place concrete. Back fill is specified under division 2 Common excavation, embankment and compaction.
  - 6. Coordinate power wiring requirements with Division 16
  - 7. Rough-in control wiring in accordance with Manufactures requirements and the National Electric Code.
  - 8. Install all grounding and lightening protection.
  - 9. Set load cell base plates in accordance with manufactures standards.
  - 10. Install scale and scale instrumentation in accordance with manufactures printed installation manual.

### 3.4 ADJUSTING AND CLEANING

- A. Adjust scale and instrumentation equipment for proper, safe, efficient operation.
- B. Test Scale and related instrumentation for proper operation in accordance with NIST H-44. Provide a Certificate of conformance to these standards.
- C. Restore marred, abraded surfaces to their original condition.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain equipment and related software. Refer to Division 1 Section "Closeout Procedures and Demonstration and Training."

END OF SECTION



## SECTION 12372 - KITCHEN CASEWORK

### PART 1 - GENERAL

#### A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### B. SUMMARY

1. This Section includes:
  - a. Wood kitchen cabinets
  - b. Plastic Laminate countertops and backsplashes
  - c. Undersink piping guard at all accessible Kitchen-type sinks.
2. Related Sections: The following Sections contain requirements that relate to this Section:
  - a. Division 15 Section "Plumbing Fixtures" for sink units mounted in countertops.
  - b. Vinyl base to finish cabinet toe-kicks is specified in Section 09650 – Resilient Flooring.
3. Note: all countertops containing sink fixtures shall be installed at 34" off finish floor. Modify all standard casework units to fit this dimension or supply manufactured handicap accessible type cabinetry.
4. Cabinetry shall meet all ADA requirements.

#### C. DEFINITIONS

1. Exposed Surfaces: Surfaces visible when drawers and opaque doors are closed or bottoms of casework 43 inches or more above finished floor.
2. Semi-exposed Surfaces: Surfaces which become visible when opaque doors are open or drawers are extended; bottoms of casework more than 30 inches above finished floor.
3. Concealed Surfaces: Surfaces considered concealed are those surfaces not visible after installation; bottoms of casework less than 30 inches above finished floor; tops of casework over 78 inches above finished floor and not visible from an upper level; stretchers, blocking, and components concealed by drawers.
4. Flush Overlay: Door and drawer faces cover cabinet frame with space between faces sufficient for operating clearance.

#### D. SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
  - a. Product data for each casework type specified.
  - b. Shop drawings for casework showing location and size, accessories, materials, finishes, and filler panels. Include fully dimensioned plans, elevations, and anchorage details to countertop and walls.
  - c. Shop drawings for countertops showing sizes, shapes, edge and backsplash profiles, cutouts for plumbing fixtures, and methods of joining.

#### KITCHEN CASEWORK

- d. Samples for initial selection purposes in the form of manufacturer's color charts consisting of sections of units showing full range of colors, textures, and patterns available for each type of material indicated or exposed to view.
- e. 1 inch x 3 inch samples of plastic laminate for countertops from manufacturer's full range of standard solid colors and patterns.

#### E. QUALITY ASSURANCE

- 1. Kitchen Casework: Comply with ANSI/NKCA A161.1 1990.
- 2. NKCA Certification: Provide kitchen casework with National Kitchen Cabinet Association (NKCA) "Certified Cabinet" seal affixed in a semi-exposed location of each unit, evidencing compliance with above standard.
  - a. Single-Source Responsibility: Obtain casework from one source from a single manufacturer.

#### F. DELIVERY, STORAGE, AND HANDLING

- 1. Deliver casework as factory-assembled units, packaged individually, and shipped each in its own carton.

#### G. PROJECT CONDITIONS

- 1. Environmental Conditions: Comply with casework manufacturer's recommendations for optimum temperature and humidity conditions during storage and installation. Do not install casework until these conditions have been attained and stabilized.
- 2. Field Measurements:
  - a. Verify casework dimensions by field measurements.
  - b. Verify kitchen casework can be installed in compliance with the original design and referenced standards.
  - c. Verify countertop size and shape prior to fabrication by field measurements taken after base units are installed.

### PART 2 - PRODUCTS

#### A. MANUFACTURERS

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Kitchen Casework:
    - (1) IXL Industries, Inc.
    - (2) Merrillat Cabinets Inc.
    - (3) Yorktowne Cabinets
  - b. Plastic Laminate for Countertops:
    - (1) Formica Corp.
    - (2) Laminart
    - (3) Nevamar Corp.
    - (4) Pionite
    - (5) Wilson Plastics Co., Dart Industries, Inc.
  - c. Undersink piping guard: Moulded vinyl or PVC under-sink pipe guard system and mounting brackets equal to 'Handi-Basin Guard' by Trubro Inc.

#### B. KITCHEN CASEWORK

#### KITCHEN CASEWORK

1. To establish design intent, style and quality desired, the specifications are based on "Coronet" series cabinets modified to meet HUD Severe Use Material Specifications as manufactured by IXL Cabinets.
  - a. Face Style: Traditional reveal overlay.
  - b. Face Frame: 3/4 inch x 1 5/8 inch solid kiln-dried hardwood frame rails and stiles with glued mortise and tenon joints. Center stiles shall be 3/4 inch thick by 3 inches wide.
  - c. Concealed Surfaces: 1/2 inch thick exterior grade hardwood plywood.
  - d. End Panels: 1/2 inch thick 5-ply 2-2 grade exterior hardwood plywood, dadoed a minimum of 1/4 inch deep to receive shelves, bottoms and tops.
  - e. Base Bottoms: 1/2 inch thick exterior hardwood plywood let into end panels, front rails and installation cleats supported by 3/4 inch solid pressure treated braces 24 inches o.c. running front to rear of cabinet.
  - f. Shelves and wall cabinet bottoms: 1/2 inch thick 2-2 grade exterior hardwood plywood with solid wood banded front edge let into dados of end panels and braced behind mulls.
  - g. Back Panels: 1/4-inch-thick 2-2-grade exterior hardwood plywood with solid wood edge bands let into dados of end panels, braced behind mulls.
  - h. Exposed Edge Treatment: Hardwood.
  - i. Doors and Drawer Fronts: Solid plantation hardwood, raised panel styling milled into a single panel of edge-glued wood. Edges shall be chamfered, stained and clear finish. Stain finish shall be selected by Architect from manufacturers full color selections.
  - j. Drawers: Fabricate with front, bottom, and back rabbeted in sides and secured with glue and mechanical fasteners as follows:
    - (1) Subfronts, Sides, and Backs: 11/16 inch thick "c" grade or better solid lumber with sides dovetailed into fronts.
    - (2) Bottoms: 1/4 inch thick exterior hardwood plywood let into front sides and backs set into rabbets in back, sides, and front.
    - (3) Drawer Suspension: Provide for a minimum capacity of 75 lbs., with twin track, side-mounted metal drawer-glide suspension. Provide self-closing feature and positive stop. Cabinet member guides attached at rear to 3/4 inch x 7 1/2 inch solid lumber hanging rail with additional cleats attached to end panels to support draw suspension at midpoint.
  - k. Joinery: Rabbeted backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.
  - l. Subbase: 3/4 inch thick solid pressure treated lumber.
  - m. Toe Board: 3/4 inch pressure treated solid lumber, attached to subbase with concealed fasteners. Exposed corners at base shall be square for vinyl base corners.

#### C. CASEWORK HARDWARE

1. General: Manufacturer's standard units complying with ANSI A156.9, of type, material, size, and finish as selected from manufacturer's standard choices.
2. Provide the following:
  - a. Hinges: Two per door.
  - b. Glides: Standard with manufacturer but factory prefinished and self closing.

#### KITCHEN CASEWORK



- c. Pulls: One per door and drawer. Type to be selected from standard range offered by manufacturer. Finish shall be stainless steel or brushed chrome.

#### D. COUNTERTOPS, PLASTIC LAMINATE

1. General: Comply with ANSI A161.2.
2. Countertop, Backsplash, and Endsplash Fabrication: Plastic laminate GP 50 on 3/4-inch particleboard.
3. Configuration: Provide countertops with the following front style, cove, and back-splash style:
  - a. Front Style: Contemporary square edge.
  - b. Cove: None. Caulk joint between top and backsplash.
  - c. Backsplash and Endsplash Style: Contemporary square edge, applied in field, scribed to walls and counter.

#### E. UNDERSINK ADA PIPING GUARD

1. General: Supply full kneespace coverage with manufactured skirt or guard that complies with the Americans With Disabilities Act (ADA).
2. Fabrication: Moulded vinyl or PVC under-sink pipe guard system and contoured mounting brackets with stainless steel attachment screws. Skirt width shall be cut to fit openings as necessary.

### PART 3 - EXECUTION

#### A. EXAMINATION

1. Examine areas and substrates to receive casework for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
  - a. Walls are plumb, and all finish has been installed.
  - b. Gypsum wallboard to be covered by casework has been painted.
  - c. Adequate blocking to anchor casework to floor and walls has been installed.
  - d. Plumbing rough-in is complete.

#### B. INSTALLATION

1. Install casework with no variations in flushness of adjoining surfaces, using concealed shims. Where casework abuts other finished work, scribe, and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework face.
2. Install casework without distortion so that doors and drawers fit openings properly and are aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessories as indicated.
3. Install casework and countertop level and plumb to a tolerance of 1/8 inch in 8 feet.
4. Fasten unit of casework to adjacent unit and into structural support members of wall construction with #10 sheet metal or wood screws with washer head or washer.

#### KITCHEN CASEWORK

5. Fasten plastic laminate countertops by screwing through corner blocks in base units into the underside of countertop. Glue joints with spline in countertops and provide concealed mechanical clamping of joint.
6. Install Basin Guard at kitchen-type sinks in accordance with manufacturer's instructions, spanning between adjacent cabinetry, after all plumbing work is completed.

#### C.ADJUSTING AND CLEANING

1. Adjust hardware to center doors and drawers in openings and lubricate to provide unencumbered operation.
2. Clean casework on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.
3. Provide final protection and maintain conditions that ensure casework remains without damage or deterioration at time of Substantial Completion, in a manner suitable to Installer.

END OF SECTION



## SECTION 12900 – BUILDING ACCESSORIES

### PART 1 - GENERAL

#### A. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

#### B. SUMMARY

1. This section includes the purchase and installation of the following:
  - a. Interior Signage
  - b. Fire Department Key Box
  - c. Corner Guards
  - d. Fire Extinguishers.
  - e. Window treatments

#### C. SUBMITTALS

1. Product data for each type of accessory specified, with installation instructions for each unit built-in or connected to other construction. Include methods of installation for each type of substrate.
2. Shop drawings showing installation details of accessories permanently affixed to construction, including full-scale installation details of special conditions.
3. Samples for initial selection purposes consisting of manufacturer's standard size samples showing full range of colors, textures, and patterns available for each type of accessory required.
4. Samples for verification purposes in full size units of each type of building accessory indicated.

#### D. QUALITY ASSURANCE

1. Manufacturer Qualifications: Firm (material producer) with not less than 3 years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.
2. Single Source Responsibility: Provide material produced by a single manufacturer for each accessory type.

#### E. DELIVERY, STORAGE, AND HANDLING

1. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, and lot number. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked off ground to prevent sagging and warping.
2. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

#### F. SEQUENCE AND SCHEDULING

1. Sequence accessory installation with other work to minimize possibility of damage soiling during remainder of construction period.

#### BUILDING ACCESSORIES

## G.MAINTENANCE

1. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against materials and method that may be detrimental to finishes and performance.

## PART 2 - PRODUCTS

### A.MANUFACTURERS

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
  - a. Interior Signs:
    - (1) Best.
    - (2) Mohawk Sign System.
    - (3) Seton Name Plate Co.
    - (4) Welch Architectural Signage
  - b. Fire Extinguishers:
    - (1) Fire extinguishers to be UL Rated 4A-60B:C standard, 10 lb. dry chemical, all purpose equipped with hose, pressure gage and rechargeable.
    - (2) Provide four (4) extinguishers and install standard, wall-support brackets in locations to be determined in the field by Fire Chief and Architect.
  - c. Fire Department Keybox:
    - (1) Supra 2HS.
    - (2) Knox.
  - d. Wall corner guards:
    - (1) Triguards, Clear Corner Protectors, 2" x 2", or approved equal for installation at exterior corners of drywall in high traffic locations and as indicated.
  - e. Window treatment:
    - (1) Mini-blinds by Bali or Luxor.

### B.FABRICATION, GENERAL

1. Provide accessory items, both free standing and permanently installed, equipped with functions as specified. Fabricate units with tight seams and joints, exposed metal edges rolled. Manufacturer or product identification on exposed surfaces is unacceptable. Provide products with smooth welds, consistent finish with no evidence of wrinkling, chipping, uneven coloration, dents, or other imperfections.

### C.INTERIOR SIGNS

1. Architectural Sign System consisting of polymer material matte, non glare finish, radius corner backplate, raised wording, graphics and Grade II Braille permanently embedded in backplate material.
2. Letters are to be 5/8" high and raised 1/32".
3. Colors to be manufacturer's standard.
4. All signs are to confirm to the requirements of the ADA.

## BUILDING ACCESSORIES

5. Provide interior signage as listed below:
  - a. One sign for each room allowing for up to 10 numbers or letters and Braille designation. Sign(s) for each of the following rooms, with Braille designation:
    - (1) Office: One.
    - (2) Lounge: One.
    - (3) Interview: One.
    - (4) Toilet: One
    - (5) Mechanical Room: One
  - b. Accessible Restroom Signs shall have international woman, man and wheelchair symbol to indicate "unisex-accessible":
    - (1) Toilets: Two.

#### D. CORNER GUARDS

1. Provide corners guards for all exposed outside corners in high traffic locations, from top of vinyl base to 4'-0" high.
  - a. Allow for a total of 4 (four).

#### E. FIRE DEPARTMENT KEY BOX

1. Fabrication: 1/8" steel wall with polyester paint UL listed lock construction.
2. Design: Recessed design with face flange to overlap siding. Drilled internally for concealed mounting hardware to connect to structural blocking or studs.

#### F. MINI-BLINDS

1. Style: Provide metal blade, 1" commercial grade, Venetian-style mini-blinds.
2. Mounting: Manufacturer's standard jamb or head mounted brackets installed within the window opening.
3. Finish: Provide factory finished blinds in color to be selected from manufacturer's full range of standard painted finishes.

### PART 3 - EXECUTION

#### A. INSTALLATION

1. Verify that materials are those specified before installing.
2. Install accessories after other finishing operations, including painting, have been completed.
3. Wall-Mounted Accessory Units: Install accessories complying with manufacturer's printed instruction, using fasteners as recommended by manufacturer as appropriate to substrate.
4. Adjust accessory items for proper operation. Clean and polish exposed surfaces, using materials and methods recommended by the manufacturer.
5. Mini blinds:
  - a. Examination
    - (1) Examine openings where horizontal louver blinds will be installed prior to beginning installation. Verify that critical dimensions are correct and surface conditions acceptable.

#### BUILDING ACCESSORIES

- (2) Complete all finishing operations, including painting, before beginning installation.
- (3) Do not proceed with installation until unsatisfactory conditions have been corrected.
- b. Installation:
  - (1) Install blinds level, plumb, and located so exterior slat edges in any position are not closer than 1 inch to interior face of glass lites, gaps between slat ends and jambs do not exceed 1/4 inch plus or minus 1/8 inch, and bottom rail in fully lowered position is within 1/2 inch of bottom of window or other opening.
- c. Cleaning:
  - (1) After completing the installation, clean blind surfaces according to the manufacturer's instructions.
  - (2) Remove surplus materials, packaging, rubbish and debris resulting from the installation. Leave areas where installation occurred neat, clean, and ready for use.
- 6. Interior Signage: Mount in accordance with ADA requirements for height and relationship to doors and hardware.
- 7. Fire department keybox: Location as acceptable to Town Fire Department.

#### B.PROTECTION

- 1. Protect accessories against damage during remainder of construction period, complying with manufacturer's directions.

END OF SECTION

#### BUILDING ACCESSORIES

## SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. The intention of these Contract Documents is to call for finished work, fully tested and ready for operation. Any components or labor not mentioned in the Contract Documents but required for functioning systems shall be provided. Should there appear to be any discrepancies or questions of intent, the Contractor shall refer the matter to the Architect/Engineer for decision before start of any related work.
- C. The drawings show the general arrangement of systems and equipment but do not show all required fittings and offsets that may be necessary to connect pipes and ductwork to equipment, and to coordinate with other trades. Provide all necessary fittings, offsets and runs based on field measurements and at no additional cost. Coordinate with other trades for space available and relative location of HVAC equipment and accessories. Pipe and duct location on the drawings shall be altered by contractor where necessary to avoid interferences and clearance difficulties.

#### 1.2 SUMMARY

- A. This Section includes mechanical items common to all specification sections.

#### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.



#### 1.4 SUBMITTALS

A. Product Data: For the following:

1. Mechanical sleeve seals.
2. Escutcheons.

#### 1.5 QUALITY ASSURANCE

- A. All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these plans and specifications.
- B. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- C. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- D. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

#### 1.6 DELIVERY, STORAGE, AND HANDLING OF PIPING

- A. Pipe and tube required by the applicable standard to be cleaned and capped shall be delivered to the job site with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipe and tube from moisture and dirt. Elevate above grade. When stored inside, do not exceed the structural capacity of the floor.
- C. Protect fittings, flanges, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

#### 1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

#### BASIC MECHANICAL MATERIALS AND METHODS

- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8.

## PART 2 - PRODUCT

### 2.1 PRODUCT CRITERIA

- A. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.
- B. Equipment Service: Products shall be supported by a service organization that maintains a complete inventory of repair parts and is located reasonably close to the site.
- C. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
- D. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
- E. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
- F. Asbestos products or equipment or materials containing asbestos shall not be used.

### 2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.3 PIPE JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Mechanical Coupling Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents and exterior environment. Gasket design shall be such that the entire coupling housing is isolated from the system contents to prevent galvanic action and inhibit galvanic corrosion.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

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F. Solvent Cements for Joining Plastic Piping:

1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.4 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
1. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
  2. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
  3. Aboveground Pressure Piping: Pipe fitting.
- B. Plastic-to-Metal Transition Fittings: one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
- C. Flexible Transition Couplings for Underground Non-pressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.5 DIELECTRIC FITTINGS

- A. Provide where copper tubing and ferrous metal pipe are joined.
- B. (2 inches) and Smaller: Threaded dielectric union, ANSI B16.39.
- C. (2 1/2 inches) and Larger: Flange union with dielectric gasket and bolt sleeves, ANSI B16.42.

2.6 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve; Thunderline LinkSeal, or approved equal.
1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  2. Pressure Plates: Glass-reinforced nylon. For fire and Hi-Temp service, pressure plates shall be steel with 2-part Zinc Dichromate and Organic Coating.
  3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.7 DUCT SYSTEMS

- A. All airstream surfaces in ventilation equipment and ducts shall be resistant to mold growth based on UL or ASTM standards.

2.8 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume adjusting, non-staining, non-corrosive, nongaseous, and recommended for interior and exterior applications.

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2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

## 2.9 MOTORS

### A. Motor Characteristics

1. Motors Smaller Than 3/4 HP: Single phase.
2. Frequency Rating: 60 Hz.
3. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
4. Service Factor: 1.15 for open drip proof motors; 1.0 for totally enclosed motors.
5. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.
6. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
7. Enclosure: as specified.

### B. Single-Phase Motors

1. Type: One of the following, to suit starting torque and requirements of specific motor application:
  - a. Permanent-split capacitor.
  - b. Split-phase start, capacitor run.
  - c. Capacitor start, capacitor run.
2. Shaded-Pole Motors: For motors 1/20 hp and smaller only.
3. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.
4. Bearings: Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, pre-lubricated-sleeve type for other single-phase motors.

## PART 3 - EXECUTION

### 3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Drawings are diagrammatic only; field-verify all existing conditions. Coordinate installations with other trades. Coordinate electrical power requirements for all motors.
- C. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings,

#### BASIC MECHANICAL MATERIALS AND METHODS

light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.

- D. Install piping and ductwork in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install mechanical systems above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Install piping to permit valve servicing.
- H. Install piping at indicated slopes.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Install piping to allow application of insulation.
- L. Select system components with pressure rating equal to or greater than system operating pressure.
- M. Verify final equipment locations for roughing-in.
- N. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

#### BASIC MECHANICAL MATERIALS AND METHODS

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  4. PVC Non-pressure Piping: Join according to ASTM D 2855.
- I. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

### 3.3 PIPE PENETRATIONS

- A. Sleeve Clearance: Sleeve through floors, walls, partitions, and beam flanges shall be one inch greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.
- B. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
1. Cut sleeves to length for mounting flush with both surfaces.
  2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  3. Install steel pipe sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
- C. To prevent accidental liquid spills from passing to a lower level, provide the following:
1. For sleeves: Extend sleeve 1-1/2 inch above finished floor and provide sealant for watertight joint.
  2. For blocked out floor openings: Provide 1-1/2 inch angle set in silicone adhesive around opening.
  3. For drilled penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- D. Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install cast-iron "wall pipes" for sleeves.

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2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- E. Sleeves are not required for wall hydrants for fire department connections or in drywall construction.
- F. Sleeves are not required for core-drilled holes.
- G. Escutcheons
1. Provide manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
  2. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
    - a. New Piping:
      - 1) Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
      - 2) Insulated Piping: One-piece, stamped-steel type with spring clips.
      - 3) Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

### 3.4 FIRESTOPPING

- A. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe and duct penetrations with fire stop materials. Refer to Division 7 for materials. Refer to Division 7 for firestopping systems.
- B. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stop materials. Refer to Division 7 for materials. Seal all penetrations through fire-or smoke-rated wall, partition, ceiling, or roof assemblies with firestopping system. Refer to Architectural plans for location of rated assemblies. Refer to Division 7 for firestopping systems.
- C. Engage an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements.
- D. Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- E. Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

#### BASIC MECHANICAL MATERIALS AND METHODS

- F. General: Use only through-penetration firestop system products that have been tested for specific fire-resistance-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
1. Latex Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture.
  2. Firestop Devices: Factory-assembled steel collars lined with intumescent material sized to fit specific outside diameter of penetrating item.
  3. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds.
  4. Wrap Strips: Single component intumescent elastomeric strips faced on both sides with a plastic film.
  5. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated with an intumescent coating contained in a flame retardant poly bag.
  6. Silicone Sealants: Moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or nonsag) or vertical surface (nonsag).
  7. Silicone Foam: Multicomponent, silicone-based liquid elastomers, that when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
- G. Comply with manufacturer's instructions for installation of through-penetration firestop systems products.
- H. Keep areas of work accessible until inspection by authorities having jurisdiction.

### 3.5 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  3. Provide dielectric fittings at connection between copper and ferrous metal.

### 3.6 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.
- E. Protection and Cleaning:



1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations. Damaged or defective items shall be replaced.
2. Protect all finished parts of equipment. Close duct and pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water, chemical, or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.

### 3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

### 3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

### 3.9 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 15050

## SECTION 15060 - HANGERS AND SUPPORTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes hangers and supports for mechanical system piping and equipment.
- B. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods"
  - 2. Division 5 Section "Metal Fabrications" for materials for attaching hangers and supports to building structure.
  - 3. Division 15 Section "Metal Ducts" for ductwork.

#### 1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Install in accordance with MSS SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports- Selection and Application
- B. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

#### 1.5 SUBMITTALS

- A. Submit product data on all hanger and support devices, including shields and attachment methods. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.
- B. Welding Certificates: Copies of certificates for welding procedures and operators.

#### 1.6 QUALITY ASSURANCE

### HANGERS AND SUPPORTS

- A. Steel pipe hangers and supports shall have the manufacturers name, part number, and applicable size stamped in the part itself for identification.
- B. Pipe Hangers, Supports, and Components: The materials of all pipe hanging and supporting elements shall be in accordance with MSS SP-58.
- C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- D. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, and seismic restraint by a licensed professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Pipe Hangers and Supports:
    - a. B-Line Systems, Inc. (Basis of Design)
    - b. Carpenter & Patterson, Inc.
    - c. Grinnell Corp.
    - d. National Pipe Hanger Corp.
    - e. Piping Technology & Products, Inc.
    - f. Unistrut

### 2.2 HANGERS

- A. Hanger "Types" listed below are from Table 1 of MSS SP-69.
- B. Uninsulated pipes 2 inch and smaller:
  - 1. Type 10: Adjustable steel swivel ring (band type) hanger, B-Line B3170.
  - 2. Type 5: Adjustable steel swivel J-hanger, B-Line B3690.
  - 3. Type 12: Malleable iron ring hanger, B-Line B3198R or hinged ring hanger, B3198H.
  - 4. Type 1: Adjustable steel clevis hanger, B-Line B3100.
- C. Uninsulated pipes 2-1/2 inch and larger:
  - 1. Type 1: Adjustable steel clevis hanger, B-Line B3100.
  - 2. Type 41: Pipe roll with sockets, B-Line B3114.
  - 3. Type 43: Adjustable steel yoke pipe roll, B-Line B3110.
- D. Insulated pipe- Hot or steam piping:
  - 1. 2 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield. Type 1 with Type 40 (B-Line B3151) series insulation protection shield.

#### HANGERS AND SUPPORTS

E. Insulated pipe- Cold piping:

1. 5 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield. Type 1 with Type 40 (B-Line B3151) series insulation protection shield.

F. Pipe Clamps

1. Type 4: When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts, B-Line B3140.
2. Type 3: For insulated lines use double bolted pipe clamps, B-Line B3144.

G. Wall Supports

1. Pipes 4 inch and smaller: Type 5 J Hanger. B-Line B3690.

H. Floor Supports

1. Hot piping under 6 inch and all cold piping: Carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. Type 38 B-Line B3093 support and B3088T threaded base stand or Type 37 B3090 and B3088 unthreaded base stand. Pipe saddle shall be screwed or welded to appropriate base stand.
2. Hot piping 6 inch and larger: Adjustable Roller stand with base plate, Type 46 B-Line B3118SL.

I. Vertical Supports

1. Type 8: Steel riser clamp sized to fit outside diameter of pipe, B-Line B3373.

J. Copper Tubing Supports

1. Hangers shall be sized to fit copper tubing outside diameters.
  - a. Type 10: Adjustable steel swivel ring (band type) hanger, B-Line B3170CT.
  - b. Type 12: Malleable iron ring hanger, B-Line B3198RCT or hinged ring hanger B3198HCT.
  - c. Type 11: Malleable iron split-ring hanger with eye socket, B-Line B3173CT.
  - d. Type 1: Adjustable steel clevis hanger, B-Line B3104CT.
2. Type 8: For supporting vertical runs use epoxy painted or plastic coated riser clamps, B-Line B3373CT or B3373CTC.
3. For supporting copper tube to strut use epoxy painted pipe straps sized for copper tubing, B-Line B2000 series, or plastic inserted vibration isolation clamps, B-Line BVT series.

K. Plastic Pipe Supports:

1. V-Bottom clevis hanger with galvanized 18-gauge continuous support channel, B-Line B3106 and B3106V, to form a continuous support system for plastic pipe or flexible tubing.

HANGERS AND SUPPORTS

L. Supplementary Structural Supports

1. Design and fabricate supports using structural quality steel bolted framing materials as manufactured by Cooper B-Line. Channels shall be roll formed, 12 gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch by 1-5/8 inch or greater as required by loading conditions. Submit designs for pipe tunnels, pipe galleries, etc., to engineer for approval. Use clamps and fittings designed for use with the strut system.

2.3 UPPER ATTACHMENTS

A. Beam Clamps

1. Beam clamps shall be used where piping is to be suspended from building steel. Clamp type shall be selected on the basis of load to be supported, and load configuration.
2. Type 23 C-Clamps shall have locknuts and cup point set screws, B-Line B351L, or B3036L.
3. Type 19 Top flange c-clamps shall be used when attaching a hanger rod to the top flange of structural shapes, B-Line B3034 or B3033.
4. Refer to manufacturers recommendation for setscrew torque.
5. Retaining straps shall be used to maintain the clamps position on the beam where required.

2.4 VIBRATION ISOLATION AND SUPPORTS

1. For refrigeration, air conditioning, hydraulic, pneumatic, and other vibrating system applications, use a clamp that has a vibration dampening insert and a nylon inserted locknut. For copper and steel tubing use B-Line BVT series Vibraclamps, for pipe sizes use BVP series.
2. For larger tubing or piping subjected to vibration, use neoprene or spring hangers as required.
3. For base mounted equipment use vibration pads, molded neoprene mounts, or spring mounts as required.
4. Vibration isolation products as manufactured by B-Line, Vibratrol systems.

2.5 ACCESSORIES

- A. Hanger Rods shall be threaded both ends, or continuous threaded rods of circular cross section. Use adjusting locknuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.
- B. Shields shall be 180 degree galvanized sheet metal, 12 inch minimum length, 18 gauge minimum thickness, designed to match outside diameter of the insulated pipe, B-Line B3151.
- C. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.
- D. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- E. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout. Characteristics: Post hardening and volume adjusting;

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recommended for both interior and exterior applications. Properties: Non-staining, non-corrosive, and nongaseous. Design Mix: 5000-psi, 28-day compressive strength.

## 2.6 FINISHES

### A. Indoor Finishes

1. Hangers and clamps for support of bare copper piping shall be coated with copper colored epoxy paint, B-Line Dura-Copper®. Additional PVC coating of the epoxy painted hanger shall be used where necessary.
2. Hangers for other than bare copper pipe shall be zinc plated in accordance with ASTM B633 OR shall have an electro-deposited green epoxy finish, B-Line Dura-Green®.
3. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 OR have an electro-deposited green epoxy finish, B-Line Dura-Green®.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

### 3.2 HANGER SPACING

- A. Support piping and tubing not listed below according to MSS SP-69 and manufacturer's written instructions.
- B. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
  1. NPS ¾ to 1-1/4": Maximum span, 7 feet; minimum rod size, 1/4 inch.
  2. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
  3. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- C. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
  1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 3/8 inch.
  2. NPS 1: Maximum span, 6 feet; minimum rod size, 3/8 inch.
  3. NPS 1-1/4: Maximum span, 6 feet; minimum rod size, 3/8 inch.
  4. NPS 1-1/2 to 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
- D. Plastic Piping Hangers:

#### HANGERS AND SUPPORTS

1. Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.
  2. Hangers shall not compress, distort, cut or abrade the piping. All piping shall be supported at intervals sufficiently close to maintain correct pipe alignment and to prevent sagging or grade reversal. Pipe should also be supported at all branch ends and at all changes of direction.
  3. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
    - a. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
    - b. NPS 3: 48 inches with 1/2-inch rod.
    - c. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
  4. Install supports for vertical PVC piping every 48 inches.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 5-feet. Install hangers for cast-iron piping with the following minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 3/8-inch rod.
  2. NPS 3: 1/2-inch rod.
  3. NPS 4 and NPS 5: 5/8-inch rod.
- F. Support vertical piping independently of connected horizontal piping. Support vertical pipes at base and at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.
- G. Place a hanger within 12 inches of each horizontal elbow.

### 3.3 HANGER AND SUPPORT INSTALLATION

- A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. The material in contact with the pipe shall be compatible with the piping material so that neither will have a deteriorating action on the other. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non-adhesive isolation tape- B-Line Iso-pipe. Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.
- C. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.

#### HANGERS AND SUPPORTS

- D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping.
- E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- I. Install hangers to provide a minimum of 1/2-inch space between finished covering and adjacent work.
- J. Do not support piping from other pipes, ductwork or other equipment that is not building structure.

### 3.4 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

### 3.5 METAL FABRICATION

- A. All attachments welded to the pipe shall be in accordance with MSS SP-58 and Pipe Fabrication Institute Standard ES-26.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### 3.6 ADJUSTING

## HANGERS AND SUPPORTS



- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

### 3.7 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 15060

## SECTION 15083 - MECHANICAL INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.
- B. Related Sections include the following:
1. Division 15 Section "Basic Mechanical Materials and Methods"
  2. Division 15 Section "Hangers and Supports" for pipe insulation shields and protection saddles.
  3. Division 15 Section "Metal Ducts" for duct liner.

#### 1.3 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for the following:
1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
  2. Attachment and covering of heat trace inside insulation.
  3. Insulation application at pipe expansion joints for each type of insulation.
  4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  5. Removable insulation at piping specialties and equipment connections.
  6. Application of field-applied jackets.
- C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

#### 1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency

#### MECHANICAL INSULATION

acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency. Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

- B. All materials shall be compatible and suitable for service temperature, and shall not contribute to corrosion or otherwise attack surface to which applied in either the wet or dry state.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.
- B. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.
- C. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.
- D. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.
- E. Follow manufacturer's recommended handling practices.

#### 1.6 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."
- B. Coordinate clearance requirements with other trades for insulation application.
- C. Coordinate installation and testing of heat tracing.

#### 1.7 SCHEDULING

- A. Schedule insulation application after testing systems. Insulation application may begin on segments of systems that have satisfactory test results.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

#### MECHANICAL INSULATION

1. Mineral-Fiber Insulation:
  - a. CertainTeed Manson.
  - b. Knauf FiberGlass GmbH.
  - c. Owens-Corning Fiberglas Corp.
  - d. Schuller International, Inc.
2. Flexible Elastomeric Thermal Insulation:
  - a. Armstrong World Industries, Inc.
  - b. Rubatex Corp.

## 2.2 PIPING INSULATION MATERIALS

- A. Mineral Fiber Glass: Knauf Pipe Insulation; heavy density molded one piece; maximum temperature 1000°F.
  1. Thermal Conductivity (k value) of .21 at 75°F mean temperature.
  2. Conforming to ASTM C 547; ASTM C 585; NFPA 90A and 90B; noncombustible.
  3. ASJ/SSL Jacketing conforming to ASTM C 1136, Type I (replacing HH-B-100B); with a maximum vapor transmission rating of .02 perms.
- B. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
  1. Adhesive: As recommended by insulation material manufacturer.
  2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
- C. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in pre-forming insulation to cover valves, elbows, tees, and flanges.

## 2.3 DUCTWORK INSULATION MATERIALS

- A. Flexible Fiber Glass Blanket: Knauf Fiber Glass Duct Wrap; conforming to ASTM C 553, Type I, II or III.
  1. Thermal Conductivity (k value) of at least .29 at 75°F mean temperature.
  2. Vapor Barrier Jacket: Foil-Scrim-Kraft (FSK); conforming to ASTM C 1136, Type II (replacing HH-B-100B); and having a maximum vapor transmission rating of .02 perms. Secured in place using outward clinch staples and appropriate pressure sensitive foil tape or glass fabric and vapor barrier mastic.
  3. Installation: Maximum allowable compression is 25%.
  4. Density:
    - a. Concealed Areas: .75 PCF (pounds per cubic foot).
    - b. Exposed Areas: 1.0 PCF (pounds per cubic foot).
- B. Through penetrations shall be firestopped using either JM Firetemp™ CI or SI firestopping products. All penetrations shall be packed with Firetemp Wrap blanket and the hole sealed with 1/2" thickness of either firestopping product.

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## 2.4 ACCESSORY MATERIALS

- A. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):
  - 1. Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure-sensitive tapes
  - 2. Support Materials - Hanger straps, hanger rods, saddles, support rings
- B. All accessory materials shall be installed in accordance with manufacturer's instructions.

## 2.5 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.

## 3.2 PREPARATION

- A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.
- B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation.
- C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

## 3.3 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout, including fittings, valves, and specialties.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each system.

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- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs and equipment.
- E. Apply multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- H. Keep insulation materials dry during application and finishing.
- I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- J. Apply insulation with the least number of joints practical.
- K. Air duct coverings shall not be installed so as to conceal or prevent use of any service opening.
- L. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.
- M. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
  - 1. Apply insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
  - 3. Install insert materials and apply insulation to tightly join the insert. Seal insulation-to-insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
- N. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- O. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- P. Maintain manufacturer's recommended temperatures and conditions for tapes, adhesives, mastics and cements.

#### MECHANICAL INSULATION

- Q. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
1. Seal penetrations with vapor-retarder mastic.
  2. Apply insulation for exterior applications tightly joined to interior insulation ends.
  3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches below top of roof flashing.
  4. Seal metal jacket to roof flashing with vapor-retarder mastic.
- R. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.
- S. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.
1. Firestopping and fire-resistive joint sealers are specified in Division 7.
  2. Patching, Filling, and Repairing. Where air ducts pass through walls, floors, or partitions required to have a fire resistance rating and where fire dampers are not required, the opening in the construction around the air duct shall not exceed one-inch average clearance on all sides and shall be filled solid with an approved material capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subjected to the same NFPA 251 time-temperature fire condition required for fire barrier penetration.

### 3.4 PIPING MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings, valves, specialties, and elbows as follows:

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1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
4. Cover fittings with PVC fitting covers.
5. Apply insulation to flanges as specified for flange insulation application.
6. Use preformed PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
7. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

### 3.5 DUCTWORK MINERAL-FIBER INSULATION APPLICATION

- A. Secure insulation with adhesive and anchor pins and speed washers.
- B. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
- C. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
- D. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
  1. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
  2. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
  3. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
  4. Do not over-compress insulation during installation.
- E. Impale insulation over anchors and attach speed washers.
- F. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- G. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1-inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
- H. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside

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radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

- I. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches o.c.
- J. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- K. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
- L. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.
- M. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.

### 3.6 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

- A. Apply insulation and fabricate fittings in accordance with the manufacturer's installation instructions.
- B. Apply sheet insulation to flat or large curved surfaces with 100 percent adhesive coverage.

### 3.7 PIPING SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Provide protective insulation as required to prevent personnel injury: Piping from zero to seven feet above all floors and access platforms including continuous blowoff, feedwater and boiler water sample, blowoff tank vent, flash tank vents and condensate tank vents, shot-type chemical feed, fire-tube boiler bottom blowoff after valves, valve by-passes, and any other related hot surface
- C. All cold surfaces that may "sweat" must be insulated. Vapor barrier must be maintained, insulation shall be applied with a continuous, unbroken moisture and vapor seal. All hangers, supports, anchors, or other projections that are secured to cold surfaces shall be insulated and vapor sealed to prevent condensation.
- D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
  - 1. Flexible connectors.
  - 2. Vibration-control devices.
  - 3. Fire-suppression piping.
  - 4. Drainage piping located in crawl spaces, unless otherwise indicated.
  - 5. Below-grade piping, unless otherwise indicated.

#### MECHANICAL INSULATION

6. Chrome-plated pipes and fittings, unless potential for personnel injury.
7. In hot piping: Unions, flexible connectors, control valves, PRV's, safety valves and discharge vent piping, vacuum breakers, thermostatic vent valves, steam traps 20 mm (3/4 inch) and smaller, exposed piping through floor for convectors and radiators. Insulate piping to within approximately 2 inches of un-insulated items.

### 3.8 PIPING INSULATION APPLICATION SCHEDULE

- A. Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements. For piping systems not indicated, insulate to with a similar thickness and type as those specified.
- B. Service: Domestic hot water.
  1. Operating Temperature: 60 to 140 deg F.
  2. Insulation Material: Mineral fiber.
  3. Insulation Thickness: Apply the following insulation thicknesses:
    - a. Pipe 1-1/4" and less: 0.5".
    - b. Pipe 1-1/2" and larger: 1".
  4. Field-Applied Jacket: None.
  5. Vapor Retarder Required: No.
  6. Finish: None.
- C. Service: Domestic cold water.
  1. Operating Temperature: 35 to 60 deg F.
  2. Insulation Material: Mineral fiber.
  3. Insulation Thickness: Apply the following insulation thicknesses:
    - a. Pipe 1-1/4" and less: 0.5".
    - b. Pipe 1-1/2" and larger: 1".
  4. Field-Applied Jacket: None.
  5. Vapor Retarder Required: Yes.
  6. Finish: None.
- D. Service: Refrigerant suction piping.
  1. Operating Temperature: 35 to 50 deg F.
  2. Insulation Material: Flexible elastomeric.
  3. Insulation Thickness: 1/2".
  4. Field-Applied Jacket: None.
  5. Vapor Retarder Required: No.
  6. Finish: None.
- E. Service: Cooling coil drain pan piping. Omit insulation on PVC piping.
  1. Operating Temperature: 35 to 50 deg F.
  2. Insulation Material: Mineral fiber.

#### MECHANICAL INSULATION

3. Insulation Thickness: ¾".
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.
6. Finish: None.

### 3.9 DUCT SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section. For duct systems not indicated, insulate to with a similar thickness and type as those specified.
- B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
  1. Internally insulated ductwork and air handling units. Omit insulation on relief air ducts (Economizer cycle exhaust air).
  2. Exhaust air ducts and plenums, and ventilation exhaust airshafts.
  3. Metal ducts with duct liner.
  4. Factory-insulated flexible ducts.
  5. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
  6. Flexible connectors.
  7. Vibration-control devices.
  8. Testing agency labels and stamps.
  9. Nameplates and data plates.
  10. Access panels and doors in air-distribution systems.

### 3.10 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

- A. Service: Supply-air ducts, concealed.
  1. Material: Mineral-fiber blanket.
  2. Thickness: 1-1/2 inches.
  3. Number of Layers: One.
  4. Field-Applied Jacket: None.
  5. Vapor Retarder Required: Yes.
- B. Service: Concealed return air duct in cold attic space
  1. Material: Mineral-fiber blanket.
  2. Thickness: 1-1/2 inches.
  3. Number of Layers: One.
  4. Field-Applied Jacket: None.
  5. Vapor Retarder Required: Yes.
- C. Service: Return-air ducts within heated building envelope: No insulation required.
- D. Service: Exhaust-air ducts, in cold attic space.
  1. Material: Mineral-fiber blanket.
  2. R-value: R6 minimum.
  3. Number of Layers: One.
  4. Field-Applied Jacket: None.

#### MECHANICAL INSULATION

5. Vapor Retarder Required: Yes.

E. Service: Outside-air ducts

1. Material: Mineral-fiber blanket.
2. R-value: R6 minimum.
3. Number of Layers: One.
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.

END OF SECTION 15083



## SECTION 15121 - PIPE EXPANSION FITTINGS AND LOOPS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes pipe expansion fittings and loops for mechanical piping systems, and the following:
  - 1. Braided Expansion Loops
  - 2. Flexible-hose expansion joints.
  - 3. Guides and anchors.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Compatibility: Products suitable for piping system fluids, materials, working pressures, and temperatures.
- B. Capability: Absorb 200 percent of maximum piping expansion between anchors.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of expansion fitting indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer.
  - 1. Design Calculations: For thermal expansion of piping systems and selection and design of expansion fittings and loops.
  - 2. Anchor Details: Detail fabrication of each indicated. Show dimensions and methods of assembly.
  - 3. Alignment Guide Details: Detail field assembly and anchorage.
- C. Welding Certificates: Copies of certificates for welding procedures and personnel.
- D. Schedule: Indicate manufacturer's number, size, location, and features for each expansion fitting and loop.

#### 1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for expansion fittings and loops by a qualified professional engineer.

1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of expansion fittings and loops that are similar to those indicated for this Project in material, design, and extent.
- B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Flexible-Hose Expansion Joints:
    - a. Flexicraft Industries.
    - b. Metraflex Co.
  2. Guides:
    - a. B-Line Systems, Inc.
    - b. Grinnell Corp.
    - c. Hyspan Precision Products, Inc.
    - d. Metraflex Co.

### 2.2 BRAIDED EXPANSION LOOPS

- A. Provide flexible expansion loops of size and type noted on drawings; Metraflex Metraloop expansion joints, or approved equal. Flexible loops shall consist of two flexible sections of hose and braid, two 90° elbows, and a 180° return assembled in such a way that the piping does not change direction, but maintains its course along a single axis. Flexible loops shall have a factory supplied, center support nut located at the bottom of the 180° return, and a drain/air release plug.
- B. Flexible loops shall impart no thrust loads to system support anchors or building structure. Loops shall be installed in a neutral, pre-compressed or pre-extended condition as required for the application.
- C. Materials of construction and end fitting type shall be consistent with pipe material and equipment/ pipe connection fittings.
- D. Size for 4" end-to-end movement.

### 2.3 GUIDES

- A. Steel, factory fabricated, with bolted two-section outer cylinder and base for alignment of piping and two-section guiding spider for bolting to pipe.

## PIPE EXPANSION FITTINGS AND LOOPS

## 2.4 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex head.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened Portland cement concrete, and tension and shear capacities appropriate for application.
  - 1. Stud: Threaded, zinc-coated carbon steel.
  - 2. Expansion Plug: Zinc-coated steel.
  - 3. Washer and Nut: Zinc-coated steel.

## PART 3 - EXECUTION

### 3.1 PIPE BEND AND LOOP INSTALLATION

- A. Install pipe bends and loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.
- B. Attach pipe bends and loops to anchors.
  - 1. Steel Anchors: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  - 2. Concrete Anchors: Attach by fasteners. Follow fastener manufacturer's written instructions.

### 3.2 SWING CONNECTIONS

- A. Connect risers and branch connections to mains with at least five pipefittings, including tee in main.
- B. Connect risers and branch connections to terminal units with at least four pipefittings, including tee in riser.
- C. Connect mains and branch connections to terminal units with at least four pipefittings, including tee in main.

### 3.3 GUIDE INSTALLATION

- A. Install guides on piping adjoining expansion fittings and loops.
- B. Attach guides to pipe and secure to building structure.

### 3.4 ANCHOR INSTALLATION

- A. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

## PIPE EXPANSION FITTINGS AND LOOPS



- B. Fabricate and install steel anchors by welding steel shapes, plates, and bars to piping and to structure. Comply with ASME B31.9 and AWS D1.1.
- C. Install pipe anchors according to expansion fitting manufacturer's written instructions if expansion fittings are indicated.

### 3.5 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 15121

## SECTION 15122 - METERS AND GAGES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes meters and gages for mechanical systems and water meters installed outside the building.
- B. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods"
  - 2. Mechanical equipment Sections that specify meters and gages as part of factory-fabricated equipment.

#### 1.3 SUBMITTALS

- A. Product Data: Include scale range, ratings, and calibrated performance curves for each meter, gage, fitting, specialty, and accessory specified.
- B. Shop Drawings: Include schedule indicating manufacturer's number, scale range, fittings, and location for each meter and gage.
- C. Product Certificates: Signed by manufacturers of meters and gages certifying accuracies under specified operating conditions and compliance with specified requirements.
- D. Maintenance Data: For meters and gages.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Liquid-in-Glass Thermometers:
    - a. Ashcroft
    - b. Ernst Gage Co.
    - c. Terice: H. O. Terice Co.
    - d. Weiss Instruments, Inc.

#### METERS AND GAGES

2. Pressure Gages:

- a. AMETEK, Inc.; U.S. Gauge Div.
- b. Dresser Industries, Inc.; Instrument Div.; Ashcroft Commercial Sales Operation.
- c. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
- d. Ernst Gage Co.
- e. Marsh Bellofram.
- f. Noshok, Inc.
- g. Trerice: H. O. Trerice Co.
- h. Weiss Instruments, Inc.

3. Test Plugs:

- a. Flow Design, Inc.
- b. MG Piping Products Co.
- c. National Meter.
- d. Peterson Equipment Co., Inc.
- e. Sisco Manufacturing Co.
- f. Trerice: H. O. Trerice Co.
- g. Watts Industries, Inc.; Water Products Div.

2.2 THERMOMETERS, GENERAL

A. Scale Range: Temperature ranges for services listed are as follows:

- 1. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions.
- 2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.
- 3. Hot Water: 30 to 300 deg F, with 2-degree scale divisions.
- 4. Condenser Water: 0 to 160 deg F, with 2-degree scale divisions.
- 5. Chilled Water: 0 to 100 deg F, with 2-degree scale divisions.
- 6. Steam and Condensate: 50 to 400 deg F, with 5-degree scale divisions.

B. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Description: ASTM E 1.

B. Case: Die cast and aluminum finished in baked-epoxy enamel, glass front, spring secured, 9-inches long.

C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

D. Tube: Red or blue reading, organic-liquid filled with magnifying lens.

E. Scale: Satin-faced non-reflective aluminum with permanently etched markings.

F. Stem: Copper-plated steel, aluminum, or brass for separable socket; of length to suit installation.

METERS AND GAGES

## 2.4 SEPARABLE SOCKETS

- A. Description: Fitting with protective socket for installation in threaded pipe fitting to hold fixed thermometer stem.
1. Material: Brass, for use in copper piping.
  2. Material: Stainless steel, for use in steel piping.
  3. Extension-Neck Length: Nominal thickness of 2 inches, but not less than thickness of insulation. Omit extension neck for sockets for piping not insulated.
  4. Insertion Length: To extend to center of pipe.
  5. Cap: Threaded, with chain permanently fastened to socket.
  6. Heat-Transfer Fluid: Oil or graphite.

## 2.5 THERMOMETER WELLS

- A. Description: Fitting with protective well for installation in threaded pipe fitting to hold test thermometer.
1. Material: Brass, for use in copper piping.
  2. Material: Stainless steel, for use in steel piping.
  3. Material: Steel, for use in steel piping.
  4. Extension-Neck Length: Nominal thickness of 2 inches, but not less than thickness of insulation. Omit extension neck for wells for piping not insulated.
  5. Insertion Length: To extend to center of pipe.
  6. Cap: Threaded, with chain permanently fastened to socket.
  7. Heat-Transfer Fluid: Oil or graphite.

## 2.6 PRESSURE GAGES

- A. Description: ASME B40.1, phosphor-bronze bourdon-tube type with bottom connection; dry type, unless liquid-filled-case type is indicated.
- B. Case: Drawn steel, brass, or aluminum with 4-1/2-inch- diameter, glass lens.
- C. Connector: Brass, NPS 1/4.
- D. Scale: White-coated aluminum with permanently etched markings.
- E. Accuracy: Grade A, plus or minus 1 percent of middle 50 percent of scale.
- F. Accuracy: Grade B, plus or minus 2 percent of middle 50 percent of scale.
- G. Range: Comply with the following:
1. Vacuum: 30 inches Hg of vacuum to 15 psig of pressure.
  2. Fluids under Pressure: Two times the operating pressure.

## 2.7 PRESSURE-GAGE FITTINGS

- A. Install pressure-gage needle valve and snubber in piping to pressure gages.

### METERS AND GAGES

- B. Install siphon instead of snubber in piping to steam pressure gages.
- C. Valves: NPS 1/4 brass or stainless steel needle type.
- D. Siphons: NPS 1/4 coil of brass tubing with threaded ends.
- E. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

## 2.8 TEST PLUGS

- A. Description: Nickel-plated, brass-body test plug in NPS 1/2 fitting.
- B. Body: Length as required to extend beyond insulation.
- C. Pressure Rating: 500 psig minimum.
- D. Core Inserts: Two self-sealing valves, suitable for inserting 1/8-inch OD probe from dial-type thermometer or pressure gage.
- E. Core Material for Air, Water, Oil, and Gas: 20 to 200 deg F, chlorosulfonated polyethylene synthetic rubber.
- F. Test-Plug Cap: Gasketed and threaded cap, with retention chain or strap.
- G. Test Kit: Pressure gage and adapter with probe, two bimetal dial thermometers, and carrying case.
  - 1. Pressure Gage and Thermometer Ranges: Approximately two times the system's operating conditions.

## PART 3 - EXECUTION

### 3.1 METER AND GAGE INSTALLATION, GENERAL

- A. Install meters, gages, and accessories according to manufacturer's written instructions for applications where used.

### 3.2 THERMOMETER INSTALLATION

- A. Install thermometers and adjust vertical and tilted positions.
- B. Install in locations as shown on the plans.
- C. Install separable sockets in vertical position in piping tees where fixed thermometers are indicated.
- D. Install thermometer wells in vertical position in piping tees where test thermometers are indicated.

### 3.3 PRESSURE-GAGE INSTALLATION

#### METERS AND GAGES

- A. Install pressure gages in piping tees with pressure-gage valve located on pipe at most readable position.
- B. Install pressure gages in the locations shown on the plans.

#### 3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:
  - 1. Install meters and gages adjacent to machines and equipment to allow service and maintenance.

#### 3.5 ADJUSTING AND CLEANING

- A. Calibrate meters according to manufacturer's written instructions, after installation.
- B. Adjust faces of meters and gages to proper angle for best visibility.
- C. Clean windows of meters and gages and clean factory-finished surfaces. Replace cracked and broken windows, and repair scratched and marred surfaces with manufacturer's touchup paint.

END OF SECTION 15122



## SECTION 15140 - DOMESTIC WATER PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes domestic water piping from locations indicated to fixtures and equipment inside the building.
- B. Drawings show the general layout of piping and accessories but do not show all required fittings and offsets that may be necessary to connect piping to equipment and to coordinate with other trades. Fabricate piping based on field measurements. Provide all necessary fittings and offsets.
- C. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods"
  - 2. Division 15 Section "Meters and Gages" for thermometers, pressure gages, and fittings.
  - 3. Division 15 Section "Hangers and Supports"
  - 4. Division 15 Section "Plumbing Specialties" for water distribution piping specialties.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
  - 1. Domestic Water Service Piping: 160 psig.
  - 2. Domestic Water Distribution Piping: 125 psig.

#### 1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Water Samples: Specified in "Cleaning" Article in Part 3.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

#### 1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.



- B. Qualify soldering processes, procedures, and solderers for copper and copper alloy pipe and tube in accordance with ASTM B 828.
- C. Qualify brazing processes for copper and copper alloy pipe and tube according to ANSI/AWS C3.4.
- D. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," and NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for combined fire-protection and domestic water service piping to building.
- E. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- C. Transition Couplings for Underground Pressure Piping: AWWA C219, metal, sleeve-type coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

### 2.2 STEEL PIPING

- A. Steel Pipe: ASTM A 53, Type E or S, Grade A or B, Schedule 40, galvanized. Include ends matching joining method.
  - 1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
  - 2. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface, and female threaded ends.
  - 3. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.
  - 4. Cast-Iron Flanges: ASME B16.1, Class 125.
  - 5. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.
  - 6. Steel-Piping, Grooved-End Fittings: ASTM A 47, galvanized, malleable-iron casting; ASTM A 106, galvanized, steel pipe; or ASTM A 536, galvanized, ductile-iron casting; with dimensions matching steel pipe.
    - a. Steel-Piping, Keyed Couplings: AWWA C606, for steel-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

### 2.3 COPPER TUBING

- A. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

## DOMESTIC WATER PIPING

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
  3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
- B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
  3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
  4. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.
    - a. Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.
- C. Mechanically formed copper or steel tee connections are not acceptable.
- 2.4 VALVES
- A. Gate Valves
1. Flanged Ends 2-1/2" and Larger: Class 125, iron body, bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge: Hammond IR1140, Nibco F617-0, Stockham G623, Milwaukee F2885 or approved equal.
  2. Comply with the following standards:
    - a. Cast Iron Valves: MSS SP - 70
    - b. Bronze Valves: MSS SP - 80
- B. Ball Valves
1. Threaded Ends 4" and Smaller: 600# W.O.G., cast bronze two piece body, hard chrome plated forged brass ball, true adjustable packing nut ("O"-ring only type stem seal not acceptable), blow-out proof stem: Hammond 8501, Nibco T-585-70, Milwaukee BA100, Apollo 70-Series, or approved equal.
  2. Soldered Ends 3" and Smaller: 600# W.O.G., cast bronze two piece body, hard chrome plated forged brass ball, true adjustable packing nut ("O"-ring only type stem seal not acceptable), blow-out proof stem: Hammond 8511, Nibco S-585-70, Milwaukee BA150, Apollo 70-Series, approved or equal.
  3. Comply with MSS SP-110.
- C. Wafer Check valves:

1. Provide wafer style, butterfly type, spring actuated check valves designed to be installed with gaskets between 2 standard Class 125 flanges. Construct iron body valves with pressure containing parts of valves with materials conforming to ANSI/ASTM A 126, Grade B. Support hanger pin by removable side plug.
2. 2" and Larger: Class 125, cast iron body, stainless steel trim, bronze disc, Buna-N seal: Nibco W920-W, Stockham WG970, Metraflex C-125, Hammond 9253, Milwaukee 1400, or approved equal.

D. Swing check valves:

1. Construct pressure containing parts of Valves as follows:
  - a. Bronze Valves: 125 or 150 psi: ANSI/ASTM B 62
  - b. Iron Body Valves: ANSI/ASTM A-126, Grade B
2. Comply with the following standards for design, workmanship, material and testing:
  - a. Bronze Valves: MSS SP - 80
  - b. Cast Iron Valves: MSS SP - 71
3. Construct valves of pressure casting free of any impregnating materials. Construct disc and hanger as one piece. Support hanger pins by removable side plug.
4. Threaded Ends 2" and Smaller: Class 125, bronze body, screwed cap, Teflon disc: Hammond IB904, Nibco T-413B, Stockham B319, Milwaukee 509 or approved equal.
5. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed cap, Teflon disc: Hammond IB912, Nibco S-413-B, Stockham B309, Milwaukee 1509 or approved equal.

E. Refer to Division 15 Section "Plumbing Specialties" for balancing and drain valves.

### PART 3 - EXECUTION

#### 3.1 EXCAVATION

- A. Refer to Division 2 for excavating, trenching, and backfilling.

#### 3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Mechanically formed tee-branch outlets and brazed joints shall not be used.
- C. Underground Domestic Water Piping: Use any of the following piping materials for each size range:
1. NPS 2 and Smaller: PE pipe; insert fittings for PE pipe; and banded or crimp-ring joints.
- D. Aboveground Domestic Water or Non-Potable Water Piping: Use the following piping materials for each size range:

#### DOMESTIC WATER PIPING

1. NPS 4 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

### 3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 and larger.
  2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
  3. Hot-Water-Piping, Balancing Duty: Calibrated, memory-stop balancing valves.
  4. Drain Duty: Hose-end drain valves.
- B. Cast-iron, grooved-end valves may be used with grooved-end piping.

### 3.4 PIPING INSTALLATION

- A. Refer to Division 2 for site water distribution and service piping.
- B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.
- C. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.
- D. Install underground PE piping according to ASTM D 2774 and ASTM F 645.
- E. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.
- F. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service. Refer to Division 15 Section "Meters and Gages" for pressure gages, and to Division 15 Section "Plumbing Specialties" for drain valves and strainers.
- G. Install aboveground domestic water piping level and plumb.
- H. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- I. Perform the following steps before operation:
  1. Close drain valves, hydrants, and hose bibbs.
  2. Open shutoff valves to fully open position.
  3. Open throttling valves to proper setting.
  4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
  5. Remove and clean strainer screens. Close drain valves and replace drain plugs.

#### DOMESTIC WATER PIPING

- 6. Remove filter cartridges from housings, and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.
- J. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.
- K. Check plumbing specialties and verify proper settings, adjustments, and operation.
- 1. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.
- L. Energize pumps and verify proper operation.

### 3.5 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- C. Grooved Joints: Assemble joints with keyed-coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

### 3.6 VALVE INSTALLATION

- A. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.
- B. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.
- C. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
  - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
  - 2. Install stop-and-waste drain valves where indicated.

### 3.7 HANGER AND SUPPORT INSTALLATION

- A. Hanger, support, and anchor devices are specified in Division 15 Section "Hangers and Supports."
- B. Refer to Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for seismic-restraint devices.

### 3.8 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.

#### DOMESTIC WATER PIPING

- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:
  - 1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  - 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
  - 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.9 FIELD QUALITY CONTROL

#### A. Inspect domestic water piping as follows:

- 1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
  - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

#### B. Test domestic water piping as follows:

- 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
- 2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- 3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- 4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.

#### DOMESTIC WATER PIPING

5. Prepare reports for tests and required corrective action.

3.10 ADJUSTING

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
  - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
  - b. Fill and isolate system according to either of the following:
    - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
    - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
  - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
  - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 15140

## SECTION 15150 – PLUMBING SANITARY AND STORM PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes soil and waste, sanitary drainage and vent piping inside the building and to locations indicated.
- B. Drawings show the general layout of piping and accessories but do not show all required fittings and offsets that may be necessary to connect piping to equipment and to coordinate with other trades. Fabricate piping based on field measurements. Provide all necessary fittings and offsets.
- C. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods"
  - 2. Division 15 Section "Plumbing Specialties" for soil, waste, and vent piping systems specialties.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: per local plumbing code.
  - 2. Sanitary Sewer, Force-Main Piping: per local plumbing code.

#### 1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

#### 1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping;



"NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

### 2.2 CAST-IRON SOIL PIPING

- A. Hub-and-Spigot Pipe and Fittings: ASTM A 74, Service Extra-Heavy class.
  - 1. Gaskets: ASTM C 564, rubber.
- B. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.

### 2.3 PVC PIPING

- A. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
  - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
- B. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.

### 2.4 CPVC Pipe: ASTM F 441/F 441M, Schedule 40.

- 1. CPVC Socket Fittings: ASTM F 438, Schedule 40.

## PART 3 - EXECUTION

### 3.1 EXCAVATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

### 3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground, Soil, Waste, and Vent Piping: Use any of the following piping materials for each size range:

#### PLUMBING SANITARY AND STORM PIPING

1. Schedule 40 PVC
- D. Vent Piping through roof/exposed above roof: Use any of the following piping materials for each size range:
1. Schedule 40 PVC
  2. ABS
- E. Underground, Soil, Waste, and Vent Piping: Use any of the following piping materials for each size range:
1. Schedule 40 PVC
- F. Gas Furnace Condensate Drain Piping: Use any of the following piping materials for each size range:
1. Schedule 40 CPVC

### 3.3 PIPING INSTALLATION

- A. Refer to Division 2 for Project-site sanitary sewer piping.
- B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.
- C. Install cleanouts at grade and extend to where building drains connect to site piping.
- D. Install cleanout fitting with closure plug inside the building in force-main piping.
- E. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.
- F. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- G. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- H. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

#### PLUMBING SANITARY AND STORM PIPING

- I. Install drainage and vent piping at the minimum slopes as required by the local plumbing code.
- J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- K. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- L. Install underground PVC soil and waste drainage piping according to ASTM D 2321.
- M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### 3.4 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
  - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- C. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Hanger, support, and anchor devices are specified in Division 15 Section "Hangers and Supports."

### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Specialties."
  - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

### 3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Prepare reports for tests and required corrective action.
- E. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
  - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - 6. Prepare reports for tests and required corrective action.

### 3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

#### PLUMBING SANITARY AND STORM PIPING

### 3.9 PROTECTION

- A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 15150

## SECTION 15183 - REFRIGERANT PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.
- B. Related Sections include the following:
1. Division 7 for materials and methods for sealing pipe penetrations through fire and smoke barriers.
  2. Division 7 for materials and methods for sealing pipe penetrations through exterior walls.
  3. Division 15 Section "Basic Mechanical Materials and Methods"
  4. Division 15 Section "Hangers and Supports" for pipe supports and installation requirements.
  5. Division 15 Section "Meters and Gages" for thermometers and pressure gages.
  6. Division 15 Section "HVAC Instrumentation and Controls" for thermostats, controllers, automatic-control valves, and sensors.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for thermostatic expansion valves, solenoid valves, and pressure-regulating valves.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and equipment.
1. Refrigerant piping indicated is schematic only. Size piping and design the actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes, to ensure proper operation and compliance with warranties of connected equipment.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- D. Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals specified in Division 1.

#### REFRIGERANT PIPING

#### 1.4 QUALITY ASSURANCE

- A. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- B. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."
- C. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Non-electrical"; or UL 429, "Electrically Operated Valves."

#### 1.5 COORDINATION

- A. Drawings show the general layout of piping and accessories but do not show all required fittings and offsets that may be necessary to connect piping to equipment and to coordinate with other trades. Fabricate piping based on field measurements. Provide all necessary fittings and offsets.
- B. Coordinate layout and installation of refrigerant piping and suspension system components with other construction, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- C. Coordinate pipe sleeve installations for foundation wall penetrations.
- D. Coordinate pipe sleeve installations for penetrations in exterior walls and floor assemblies. Coordinate with requirements for firestopping specified in Division 7 for materials and methods for sealing pipe penetrations through fire and smoke barriers.
- E. Coordinate pipe fitting pressure classes with products specified in related Sections.

#### PART 2 - PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Refrigerants:
    - a. Allied Signal, Inc./Fluorine Products; Genetron Refrigerants.
    - b. DuPont Company; Fluorochemicals Div.
    - c. Elf Atochem North America, Inc.; Fluorocarbon Div.
    - d. ICI Americas Inc./ICI KLEA; Fluorochemicals Bus.
  - 2. Refrigerant Valves and Specialties:
    - a. Climate & Industrial Controls Group; Parker-Hannifin Corp.; Refrigeration & Air Conditioning Division.
    - b. Danfoss Electronics, Inc.
    - c. Emerson Electric Company; Alco Controls Div.
    - d. Henry Valve Company.
    - e. Sporlan Valve Company.

## 2.2 COPPER TUBE AND FITTINGS

- A. Seamless Copper Tube: ASTM B 280-Type ACR; ASTM B 88-Type L.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Bronze Filler Metals: AWS A5.8, Classification BAg-1 (silver)

## 2.3 VALVES

- A. Diaphragm Packless Valves: 500-psig working pressure and 275 deg F working temperature; globe design with straight-through or angle pattern; forged-brass or bronze body and bonnet, phosphor bronze and stainless-steel diaphragms, rising stem and handwheel, stainless-steel spring, nylon seat disc, and with solder-end connections.
- B. Packed-Angle Valves: 500-psig working pressure and 275 deg F working temperature; forged-brass or bronze body, forged-brass seal caps with copper gasket, back seating, rising stem and seat, molded stem packing, and with solder-end connections.
- C. Check Valves Smaller Than NPS 1: 400-psig operating pressure and 285 deg F operating temperature; cast-brass body, with removable piston, polytetrafluoroethylene seat, and stainless-steel spring; globe design. Valve shall be straight-through pattern, with solder-end connections.
- D. Check Valves, NPS 1 and Larger: 400-psig operating pressure and 285 deg F operating temperature; cast-bronze body, with cast-bronze or forged-brass bolted bonnet; floating piston with mechanically retained polytetrafluoroethylene seat disc. Valve shall be straight-through or angle pattern, with solder-end connections.
- E. Service Valves: 500-psig pressure rating; forged-brass body with copper stubs, brass caps, removable valve core, integral ball check valve, and with solder-end connections.
- F. Solenoid Valves: Comply with ARI 760; 250 deg F temperature rating and 400-psig working pressure; forged brass, with polytetrafluoroethylene valve seat, 2-way, straight-through pattern, and solder-end connections; manual operator; fitted with suitable NEMA 250 enclosure of type required by location, with 1/2-inch conduit adapter and [24] [120]-V, normally [closed] [open] holding coil.
- G. Pressure Relief Valves: Straight-through or angle pattern, brass body and disc, neoprene seat, and factory sealed and ASME labeled for standard pressure setting.
- H. Thermostatic Expansion Valves: Comply with ARI 750; brass body with stainless-steel parts; thermostatic-adjustable, modulating type; size and operating characteristics as recommended by manufacturer of evaporator, and factory set for superheat requirements; solder-end connections; with sensing bulb, distributor having side connection for hot-gas bypass line, and external equalizer line.



- I. Hot-Gas Bypass Valve: Pulsating-dampening design, stainless-steel bellows and polytetrafluoroethylene valve seat; adjustable; sized for capacity equal to last step of compressor unloading; with solder-end connections.

## 2.4 REFRIGERANT PIPING SPECIALITIES

- A. Straight- or Angle-Type Strainers: 500-psig working pressure; forged-brass or steel body with stainless-steel wire or brass-reinforced Monel screen of 80 to 100 mesh in liquid lines up to 1-1/8 inches, 60 mesh in larger liquid lines, and 40 mesh in suction lines; with screwed cleanout plug and solder-end connections.
- B. Moisture/Liquid Indicators: 500-psig maximum working pressure and 200 deg F operating temperature; all-brass body with replaceable, polished, optical viewing window with color-coded moisture indicator; with solder-end connections.
- C. Replaceable-Core Filter-Dryers: 500-psig maximum working pressure; heavy gage protected with corrosion-resistant-painted steel shell, flanged ring and spring, ductile-iron cover plate with steel cap screws; wrought-copper fittings for solder-end connections; with replaceable-core kit, including gaskets and the following:
  - 1. Filter Cartridge: Pleated media with integral end rings, stainless-steel support, ARI 730 rated for capacity.
  - 2. Filter-Dryer Cartridge: Pleated media with solid-core sieve with activated alumina, ARI 730 rated for capacity.
  - 3. Wax Removal Cartridge: Molded, bonded core of activated charcoal and desiccant with integral gaskets.
- D. Permanent Filter-Dryer: 350-psig maximum operating pressure and 225 deg F maximum operating temperature; steel shell and wrought-copper fittings for solder-end connections; molded-felt core surrounded by desiccant.
- E. Mufflers: 500-psig operating pressure, welded-steel construction with fusible plug; sized for refrigeration capacity.

## 2.5 REFRIGERANTS

- A. ASHRAE 34, R-134a
- B. ASHRAE 34, R-22

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Aboveground, within Building: Type ACR drawn-copper tubing or Type L drawn-copper tubing.
- B. Belowground for NPS 2 and Smaller: Type K annealed-copper tubing.

#### REFRIGERANT PIPING

### 3.2 VALVE APPLICATIONS

- A. Install diaphragm packless or packed-angle valves in suction and discharge lines of compressor, for gage taps at hot-gas bypass regulators, on each side of strainers.
- B. Install check valves in compressor discharge lines and in condenser liquid lines on multiple condenser systems.
- C. Install packed-angle valve in liquid line between receiver shutoff valve and thermostatic expansion valve for system charging.
- D. Install diaphragm packless or packed-angle valves on each side of strainers and dryers, in liquid and suction lines at evaporators, and elsewhere as indicated.
- E. Install a full-sized, three-valve bypass around each dryer.
- F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve.
  - 1. Install solenoid valves in horizontal lines with coil at top.
  - 2. Electrical wiring for solenoid valves is specified in Division 16 Sections. Coordinate electrical requirements and connections.
- G. Install thermostatic expansion valves as close as possible to evaporator.
  - 1. If refrigerant distributors are used, install them directly on expansion-valve outlet.
  - 2. Install valve so diaphragm case is warmer than bulb.
  - 3. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
  - 4. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install pressure regulating and pressure relief valves as required by ASHRAE 15. Pipe pressure relief valve discharge to outside.

### 3.3 SPECIALTY APPLICATIONS

- A. Install liquid indicators in liquid line leaving condenser, in liquid line leaving receiver, and on leaving side of liquid solenoid valves.
- B. Install strainers immediately upstream from each automatic valve, including expansion valves, solenoid valves, hot-gas bypass valves, and compressor suction valves.
- C. Install strainers in main liquid line where multiple expansion valves with integral strainers are used.
- D. Install moisture-liquid indicators in liquid lines between filter-dryers and thermostatic expansion valves and in liquid line to receiver.
- E. Install replaceable-core filter-dryers in vertical liquid line adjacent to receivers and before each solenoid valve.

#### REFRIGERANT PIPING

- F. Install permanent filter-driers in low-temperature systems, in systems using hermetic compressors, and before each solenoid valve.
- G. Install solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control, in liquid line of single or multiple evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into suction line when system shuts down.
- H. Install receivers, sized to accommodate pump-down charge, on systems 5 tons and larger and on systems with long piping runs.
- I. Install flexible connectors at or near compressors where piping configuration does not absorb vibration.

### 3.4 PIPING INSTALLATION

- A. Install refrigerant piping according to ASHRAE 15.
- B. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- C. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- D. Arrange piping to allow inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.
- E. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
- F. Belowground, install copper tubing in protective conduit. Vent conduit outdoors.
- G. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.
- H. Slope refrigerant piping as follows:
  - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
  - 2. Install horizontal suction lines with a uniform slope downward to compressor.
  - 3. Install traps and double risers to entrain oil in vertical runs.
  - 4. Liquid lines may be installed level.
- I. Install bypass around moisture-liquid indicators in lines larger than NPS 2.
- J. Install unions to allow removal of solenoid valves, pressure-regulating valves, and expansion valves and at connections to compressors and evaporators.

### REFRIGERANT PIPING

- K. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.

### 3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Division 15 Section "Hangers and Supports."
- B. Refer to Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for seismic-restraint devices.

### 3.6 PIPE JOINT CONSTRUCTION

- A. Braze joints according to Division 15 Section "Basic Mechanical Materials and Methods."
- B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.

### 3.7 FIELD QUALITY CONTROL

- A. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI.
  - 1. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure.
  - 2. Test high- and low-pressure side piping of each system at not less than the lower of the design pressure or the setting of pressure relief device protecting high and low side of system.
    - a. System shall maintain test pressure at the manifold gage throughout duration of test.
    - b. Test joints and fittings by brushing a small amount of soap and glycerine solution over joint.
    - c. Fill system with nitrogen to raise a test pressure of 150 psig or higher as required by authorities having jurisdiction.
    - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

### 3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
  - 1. Check compressor oil level above center of sight glass.

#### REFRIGERANT PIPING

2. Open compressor suction and discharge valves.
3. Open refrigerant valves, except bypass valves that are used for other purposes.
4. Check compressor-motor alignment, and lubricate motors and bearings.

### 3.9 CLEANING

- A. Before installing copper tubing other than Type ACR, clean tubing and fittings with trichloroethylene.
- B. Replace core of filter-dryer after system has been adjusted and design flow rates and pressures are established.

### 3.10 SYSTEM CHARGING

- A. Charge system using the following procedures:
  1. Install core in filter-dryer after leak test but before evacuation.
  2. Evacuate entire refrigerant system with a vacuum pump to a vacuum of 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
  3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
  4. Charge system with a new filter-dryer core in charging line. Provide full-operating charge.

END OF SECTION 15183

## SECTION 15194 - FUEL GAS PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes fuel gas piping, specialties, and accessories within the building.
- B. Related Sections include the following:
1. Division 7 Section for materials and methods for sealing pipe penetrations through fire and smoke barriers.
  2. Division 15 Section "Basic Mechanical Materials and Methods" for general piping materials and installation requirements.
  3. Division 15 Section "Hangers and Supports" for pipe supports, product descriptions, and installation requirements.
  4. Division 15 Section "Mechanical Identification" for labeling and identifying hydronic piping.
  5. Division 2 Sections.
  6. Division 15 Section "Meters and Gages" for pressure gages.

#### 1.3 PROJECT CONDITIONS

- A. Gas System Pressure: One pressure range. More than 0.5 psig (3.45 kPa) but not more than 2.0 psig (13.8 kPa).

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
1. Corrugated, stainless-steel tubing systems. Include associated components.
  2. Specialty valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
  3. Pressure regulators. Include pressure rating, capacity, and settings of selected models.
  4. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

- C. Maintenance Data: Propane gas specialties and accessories to include in maintenance manuals specified in Division 1.

## 1.5 QUALITY ASSURANCE

- A. Electrical Components and Devices: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ANSI Standard: Comply with ANSI Z223.1, "National Fuel Gas Code."
- C. FM Standard: Provide components listed in FM's "Fire Protection Approval Guide" if specified to be FM approved.
- D. IAS Standard: Provide components listed in IAS's "Directory of A. G. A. and C. G. A Certified Appliances and Accessories" if specified to be IAS listed.
- E. UL Standard: Provide components listed in UL's "Gas and Oil Equipment Directory" if specified to be UL listed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Corrugated, Stainless-Steel Tubing Systems:
    - a. Omega Flex, Inc.
    - b. Titeflex Corp.
    - c. Tru-Flex Metal Hose Corp.
    - d. Ward Manufacturing, Inc.
  - 2. Appliance Connector Valves:
    - a. American Valve.
    - b. B&K Industries, Inc.
    - c. Brass Craft Manufacturing Co.
    - d. Conbraco Industries, Inc.; Apollo Div.
    - e. Key Gas Components, Inc.
    - f. Legend Valve and Fitting, Inc.
    - g. McDonald: A. Y. McDonald Mfg. Co.
    - h. Mueller Co.; Mueller Gas Products Div.
    - i. Robert Manufacturing Co.
    - j. State Metals, Inc.
    - k. Watts Industries, Inc.; Water Products Div.
  - 3. Gas Valves, NPS 2 (DN 50) and Smaller:
    - a. Crane Valves.
    - b. Flow Control Equipment, Inc.

#### FUEL GAS PIPING

- c. Grinnell Corp.
  - d. Honeywell, Inc.
  - e. Jomar International, Ltd.
  - f. Milwaukee Valve Co., Inc.
  - g. Mueller Co.; Mueller Gas Products Div.
  - h. Nibco, Inc.
  - i. Red-White Valve Corp.
  - j. Watts Industries, Inc.; Water Products Div.
4. Plug Valves, NPS 2-1/2 (DN 65) and Larger:
- a. Flow Control Equipment, Inc.
  - b. Milliken Valve Co., Inc.
  - c. Nordstrom Valves, Inc.
  - d. Olson Technologies, Inc.; Homestead Valve Div.
  - e. Walworth Co.
5. Automatic Gas Valves:
- a. ASCO General Controls.
  - b. Automatic Switch Co.
  - c. Eaton Corp.; Controls Div.
  - d. Eclipse Combustion, Inc.
  - e. GPS Gas Protection Systems, Inc.
  - f. Honeywell, Inc.
  - g. Johnson Controls, Inc.
6. Electrically Operated Gas Valves:
- a. ASCO General Controls.
  - b. Atkomatic Valve Co., Inc.
  - c. Automatic Switch Co.
  - d. Eclipse Combustion Inc.
  - e. Magnatrol Valve Corp.
  - f. Parker Hannifin Corp.; Climate & Industrial Controls Group; Skinner Valve Div.
7. UL-Listed Earthquake Valves:
- a. Energy Pacific.
  - b. Safe T Quake Corp.
  - c. Seismic Safety Products, Inc.
  - d. Seismic Valve Co., Inc.
  - e. Trembler-Tech, Inc.
  - f. Westcoast Seismic Protection Co., Ltd.
8. Meters:
- a. American Meter Co.
  - b. Badger Meter, Inc.; Utility Products Div.
  - c. Equimeter, Inc.



- d. National Meter.
  - e. Schlumberger Industries; Gas Div.
9. Service Pressure Regulators:
- a. American Meter Co.
  - b. Equimeter, Inc.
  - c. Fisher Controls International, Inc.
  - d. National Meter.
  - e. Richards Industries, Inc.; Jordan Valve Div.
  - f. Schlumberger Industries; Gas Div.
10. Line and Appliance Pressure Regulators:
- a. American Meter Co.
  - b. Fisher Controls International, Inc.
  - c. Maxitrol Co.
  - d. National Meter.
  - e. Richards Industries, Inc.; Jordan Valve Div.
  - f. Schlumberger Industries; Gas Div.

## 2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

## 2.3 CORRUGATED, STAINLESS-STEEL TUBING SYSTEMS

- A. Description: Comply with AGA LC 1 and include the following:
  - 1. Tubing: Corrugated stainless steel with plastic jacket or coating.
  - 2. Fittings: Copper alloy with ends made to fit corrugated tubing. Include ends with threads according to ASME B1.20.1 if connection to threaded pipe or fittings is required.
  - 3. Striker Plates: Steel, designed to protect tubing from penetrations.
  - 4. Manifolds: Malleable iron or steel with protective coating. Include threaded connections according to ASME B1.20.1 for pipe inlet and corrugated tubing outlets.

## 2.4 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

- A. Steel Pipe: ASTM A 53; Type E or S; Grade B; Schedule 40; black.
  - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
  - 2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
  - 3. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
  - 4. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
  - 5. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
  - 6. Joint Compound and Tape: Suitable for propane gas.
  - 7. Steel Flanges and Flanged Fittings: ASME B16.5.

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8. Gasket Material: Thickness, material, and type suitable for propane gas.
- B. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B), water tube, drawn temper.
    1. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.
    2. Brazing Filler Metals: AWS A5.8, Silver Classification BAg-1. Filler metal containing phosphorus is prohibited.
    3. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.
    4. Gasket Material: Thickness, material, and type suitable for propane gas.
  - C. Soft Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B), water tube, annealed temper.
    1. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.
    2. Brazing Filler Metals: AWS A5.8, Silver Classification BAg-1. Filler metal containing phosphorus is prohibited.
  - D. Tin-Lined Copper Tube: ASTM B 280, seamless, annealed, with interior tin-plated lining.
    1. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.
    2. Brazing Filler Metals: AWS A5.8, Silver Classification BAg-1. Filler metal containing phosphorus is prohibited.
  - E. Transition Fittings: Type, material, and end connections to match piping being joined.
  - F. Common Joining Materials: Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joining materials not in this Section.
- 2.5 PROTECTIVE COATING
- A. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in corrosive atmosphere.
- 2.6 PIPING SPECIALTIES
- A. Flexible Connectors: ANSI Z21.24, copper alloy.
  - B. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.
- 2.7 SPECIALTY VALVES
- A. Valves, NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
  - B. Appliance Connector Valves: ANSI Z21.15 and IAS listed.
  - C. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig (13.8-kPa) minimum pressure rating.

- D. Gas Valves, NPS 2 (DN 50) and Smaller: ASME B16.33 and IAS-listed bronze body and 125-psig (860-kPa) pressure rating.

- 1. Tamperproof Feature: Include design for locking.

- E. Automatic Gas Valves: ANSI Z21.21, with electrical operator for actuation by appliance automatic shutoff device.

- F. Electrically Operated Gas Valves: UL 429, bronze, aluminum, or cast-iron body solenoid valve; 120-V ac, 60 Hz, Class B, continuous-duty molded coil. Include NEMA ISC 6, Type 4, coil enclosure and electrically opened and closed dual coils. Valve position shall normally be closed.

## 2.8 PRESSURE REGULATORS

- A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.

- 1. NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

- 2. NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

- 3. Service Pressure Regulators: ANSI Z21.80. Include 100-psig- (690-kPa-) minimum inlet pressure rating.

- 4. Line Pressure Regulators: ANSI Z21.80 with 2-psig- (13.8-kPa-) minimum inlet pressure rating.

- 5. Appliance Pressure Regulators: ANSI Z21.18. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

- B. Pressure Regulator Vents: Factory- or field-installed, corrosion-resistant screen in opening if not connected to vent piping.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

- B. Comply with ANSI Z223.1, "Prevention of Accidental Ignition" Paragraph.

### 3.2 SERVICE ENTRANCE PIPING

- A. Extend fuel gas piping and connect to fuel gas distribution for service entrance to building.

- 1. Propane gas distribution system piping and service pressure regulator are specified in Division 2 Section "Natural Gas Distribution."

## FUEL GAS PIPING

- B. Install strainer upstream from each earthquake valve. Refer to Division 15 Section "Plumbing Specialties" for strainers.

### 3.3 PIPING APPLICATIONS

- A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.
- B. Fuel Gas Piping: Use the following:
  - 1. NPS 1/2 (DN 15) and Smaller: NPS 3/4 (DN 20) steel pipe, malleable-iron threaded fittings, and threaded joints.
    - a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.
  - 2. NPS 3/4 and NPS 1 (DN 20 and DN 25): Steel pipe, malleable-iron threaded fittings, and threaded joints.
    - a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.
- C. Underground Fuel Gas Piping: Steel pipe, steel welding fittings, and welded joints. Encase in containment conduit.
- D. Containment Conduits: Steel pipe, steel welding fittings, and welded joints.

### 3.4 VALVE APPLICATIONS

- A. Appliance Shutoff Valves for Pressure 0.5 psig (3.45 kPa) or Less: Appliance connector valve or gas stop.
- B. Appliance Shutoff Valves for Pressure 0.5 to 2 psig (3.45 to 13.8 kPa): Gas stop or gas valve.
- C. Appliance Shutoff Valves for Pressure 2 to 5 psig (13.8 to 34.5 kPa): Gas valve.
- D. Piping Line Valves, NPS 2 (DN 50) and Smaller: Gas valve.
- E. Piping Line Valves, NPS 2-1/2 (DN 65) and Larger: Plug valve or general-duty valve.

### 3.5 PIPING INSTALLATION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.
- B. Concealed Locations: Except as specified below, install concealed gas piping in airtight conduit constructed of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.

#### FUEL GAS PIPING

1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums. Do not locate valves above ceilings.
  2. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls.
    - a. Exception: Tubing passing through partitions or walls.
  3. In Walls: Gas piping with welded joints and protective wrapping specified in "Protective Coating" Article in Part 2 may be installed in masonry walls, subject to approval of authorities having jurisdiction.
  4. Prohibited Locations: Do not install gas piping in or through circulating air ducts, chimneys or gas vents (flues), or ventilating ducts.
- C. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.
1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches (75 mm) long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.
- D. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.
- E. Install fuel gas piping at uniform grade of  $\frac{1}{4}$ " per 15 feet.
- F. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- G. Connect branch piping from top or side of horizontal piping.
- H. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.
- I. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.
- J. Install pressure gage upstream and downstream from each line pressure regulator.
- K. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.
- L. Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches (100 mm) outside building, and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal-tar, epoxy-polyamide paint according to SSPC-Paint 16.

#### FUEL GAS PIPING

### 3.6 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

### 3.7 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Division 15 Section "Hangers and Supports."
- B. Refer to Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for seismic-restraint devices.

### 3.8 CONNECTIONS

- A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.
- B. Install piping adjacent to appliances to allow service and maintenance.
- C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches (1800 mm) of each appliance. Install union downstream from valve.
- D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

### 3.9 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each service meter, pressure regulator, and specialty valve.
  - 1. Text: In addition to name of identified unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

### 3.10 PAINTING

- A. Use materials and procedures in Division 9 Section "Painting," "Exterior Paint Schedule" Article, "Ferrous Metal" Paragraph, "Full-Gloss, Alkyd-Enamel Finish" Subparagraph.
- B. Paint exterior pressure regulators, and specialty valves. Color: Gray.

### 3.11 FIELD QUALITY CONTROL

- A. Inspect, test, and purge piping according to ANSI Z223.1, Part 4 "Inspection, Testing, and Purging," and requirements of authorities having jurisdiction.
- B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.
- C. Report test results promptly and in writing to Architect and authorities having jurisdiction.

#### FUEL GAS PIPING

- D. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.
- E. Verify correct pressure settings for pressure regulators.
- F. Verify that specified piping tests are complete.

3.12 ADJUSTING

- A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION 15194

## SECTION 15410 - PLUMBING FIXTURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes plumbing fixtures and related components.
- B. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods"
  - 2. Division 15 Section "Plumbing Specialties" for specialty fixtures not in this Section.

#### 1.3 SUBMITTALS

- A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.
- B. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

#### PLUMBING FIXTURES



- E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

#### 1.5 COORDINATION

- A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

### PART 2 - PRODUCTS

#### 2.1 LAVATORY and SINK FAUCETS

##### A. Faucet Type 1:

1. Symmons, Model #SCOT S-60-H-OFG
2. Metering/temperature selection lavatory faucet
3. Maximum Flow Rate: 0.5 gpm, unless otherwise indicated.
4. Body Material: Cast brass.
5. Finish: Polished chrome plate.
6. Centers: 4" center-set with temperature limit stop to adjust outlet temperature and time limit stop to adjust flow time.
7. Handle: ADA blade type
8. Mounting: Deck, exposed.
9. Inlet(s): NPS 3/8 tubing, plain end.
10. Spout: Rigid.
11. Spout Outlet: Spray.
12. Drain: offset grid drain.
13. Tempering Device: no.
14. Include (2) in-line check/screen assemblies.

##### B. Faucet Type 2:

1. Chicago Faucet Co., Model #1201-AHA8CP
2. Slow compression cartridge.
3. Valve shall have a self-contained renewable unit with replaceable stainless steel seat.
4. CSA B125 certified and comply with ANSI/ASME A112.18.1M.
5. Maximum Flow Rate: 2.0 gpm, unless otherwise indicated.
6. Body Material: Solid brass.
7. Finish: Polished chrome plate.
8. Mixing Valve: Two-lever handle.
9. Centers: 8 inches.
10. Mounting: Deck mounted, concealed fitting.
11. Handles: Chicago Faucet Co., Model #1000 ADA single-wing lever, 2" length, all metal.
12. Inlets: 1/2" NPSM coupling nut.
13. Spout: High rise swing spout
14. Spout Outlet: Chicago Faucet Co., Model #E12 aerator.
15. Vacuum Breaker: Not Required.

#### PLUMBING FIXTURES

16. Drain: Not required.
17. Tempering Device: no.

## 2.2 SHOWER FAUCETS

### A. Manufacturers

1. Symmons
2. Powers

### B. ADA Pressure balanced shower mixing valve: Symmons Temptrol Model S-96-300-B30-L-V-X.

1. Maximum Flow Rate: 2.5 gpm, unless otherwise indicated.
2. Body Material: Cast brass.
3. Finish: Polished chrome plate.
4. Type: Single-handle pressure balance.
5. Mounting: Concealed.
6. Handle: Lever with adjustable stop screw to limit handle turn. Set limit to a maximum shower temperature of 110 degrees F.
7. Diverter Valve: Not required.
8. Anti-scald Device: Integral with mixing valve.
9. Supply Connections: 1/2". Provide integral service stops.
10. Shower Head Material: Metallic with chrome-plated finish.
11. Head Type: Hand held, slide-bar mounted. Wall/hand shower to have flexible metal hose, in-line vacuum breaker, wall connection, and flange. Provide 30" slide bar for hand shower mounting.
12. Spray Pattern: Fixed.
13. Integral Volume Control: Required.

### C. Service Sink Faucet: Chicago Model 540-LD897SWXF with Quatern operating cartridge.

1. Maximum Flow Rate: 2.5 gpm, unless otherwise indicated.
2. Body Material: Cast brass.
3. Finish: Polished or rough brass.
4. Mixing Valve: Two-lever handle.
5. Centers: 8 inches.
6. Mounting: Back/wall, exposed.
7. Handles: Chicago #369 ADA lever handles.
8. Inlets: 1/2" NPT female union. Provide check valves at HW and CW connections.
9. Spout: vacuum breaker spout with pail hook and wall brace.
10. Spout Outlet: 3/4" male thread hose outlet.

## 2.3 TOILET SEATS

### A. Toilet Seat Type 1: Solid plastic, chemical resistant, integrally molded bumpers.

## PLUMBING FIXTURES

1. Manufacturers: Church, Olson, or American Standard.
2. Configuration: Open front without cover.
3. Size: Elongated.
4. Class: Standard commercial.
5. Hinge Type: concealed check hinge with stainless steel post.
6. Color: White.

## 2.4 PROTECTIVE SHIELDING GUARDS

- A. Manufacturers: Truebro Lav-Guard, McGuire ProWrap, or approved equal.
- B. Protective Shielding Guard: Manufactured, plastic covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.

## 2.5 FIXTURE SUPPORTS

- A. Provide for accessible or standard mounting height as required.

## 2.6 WATER CLOSETS

### A. Floor Mounted Water Closet (P-1):

1. American Standard, Cadet Model #2898.012
2. Material: Vitreous-china
3. Style: Gravity.
4. Bowl Type: Elongated
5. Design Consumption: 1.6 gal./flush.
6. Color: White..
7. Toilet Seat: Type 1.
8. Fixture Support: None.
9. Rim Height: Standard, rim height at 14 1/8" above floor.

### B. Floor Mounted ADA Water Closet (P-1A):

1. American Standard, Cadet Model #2998.012
2. Style: Gravity
3. Material: Vitreous-china
4. Bowl Type: Elongated.
5. Design Consumption: 1.6 gal./flush.
6. Color: White.
7. Toilet Seat: Type 1.
8. Fixture Support: None.
9. Rim Height: Standard, rim height at 16 1/8" above floor.
10. Provide left hand or right hand as required by ADA.

## 2.7 LAVATORIES

### A. Manufacturers:

1. American Standard
2. Kohler

## PLUMBING FIXTURES

3. Elger

B. Wall hung lavatory (P-3A):

1. American Standard, Lucerne Model #0355.012
2. Type: With back.
3. Size: 20 by 18 inches 24 by 20 inches outside, rectangular.
4. Faucet Hole Punching: Three, 2-inch centers, holes.
5. Faucet Hole Location: Top.
6. Color: White.
7. Faucet: Faucet Type 1
8. Supplies: NPS 3/8 chrome-plated copper with stops.
9. Drain: See faucet.
10. Drain Piping: NPS 1-1/4 by NPS 1-1/2 chrome-plated cast-brass trap; 0.045-inch- thick tubular brass waste to wall; and wall escutcheon.
11. Protective Shielding Guards: yes.
12. Fixture Support: concealed arms.
13. Tempering Device: no.
14. Mounting Height as detailed on architectural plans.

2.8 SINKS

A. Kitchenette Sink (P-4):

1. Manufacturers
  - a. Elkay Manufacturing Co., Model # LRAD2521
  - b. Just Manufacturing Co.
  - c. Kindred
2. Overall Size: 25" X 21" X 5-1/2".
3. Number of Compartments: One.
4. Mounting: Counter, self-rimming.
5. Material: Type 304 Stainless steel
6. Underside undercoating to dampen sound and prevent condensation.
7. Faucet: Type 2.
8. Hole punchings: three holes on 4" centers to accommodate faucet. Coordinate requirements.
9. Supplies: NPS 1/2 chrome-plated copper with stops.
10. Drain Piping: offset drain, 2" chrome-plated cast-brass trap, 0.045-inch- thick tubular brass waste to wall, and wall escutcheon.
11. Protective Shielding Guards: Yes, in locations where accessible for ADA compliance. Refer to architectural plans for required locations.
12. Tempering Device: no.

2.9 INDIVIDUAL SHOWERS

PLUMBING FIXTURES

- A. ADA Transfer Shower (P-5): Aquabath Model C4136BF: Accessible shower enclosure with slip-resistant bathing surface complying with ASTM F 462 and shower rod with curtain.
- a. Aqua Bath Co., Inc.
  - b. Aquarius.
  - c. Kohler Co.
  - d. LASCO Bathware
  - e. Praxis Industries, Inc., Aquarius Products
2. Size: 36" X 36" X 78.75" H.
  3. Material: Acrylic, one-piece surround.
  4. Color: White.
  5. Drain Location: Center.
  6. Soap tray: molded in.
  7. Seat: ADA fold-up.
  8. Grab bars: stainless steel; with proper ADA clearances, heights and supports; one wrap around, and one 18" straight.
  9. Faucet: ADA Pressure balanced shower-mixing valve. Provide all required mounting brackets.
  10. Drain: Grid, NPS 2.
  11. Pit required: no, provide shower with 3/4" maximum threshold height.

## 2.10 MOP SERVICE BASINS

- A. Service Basins, Fiat Products # MSB2424: Flush-to-wall, floor-mounting precast *Molded Stone* basin with rim guard.
1. Shape: square.
  2. Size: 24 by 24 inches.
  3. Wall guards: 12 inch high stainless steel for both walls
  4. Height: 10 inches.
  5. Vinyl Rim Guard: On both front surfaces.
  6. Color: White.
  7. Faucet: Service sink faucet.
  8. Drain: Stainless steel, 3" outlet, with combination dome strainer and lint basket.
  9. Mop hanger: Fiat # 889-CC; 24" long X 3" wide, stainless steel, with three (3) rubber tool grips.
  10. Furnish and install a tube of sealant for sealing gap between fixture and wall.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

## PLUMBING FIXTURES

- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 FIXTURE INSTALLATION

- A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- C. Install counter-mounting fixtures in and attached to casework.
- D. Kitchen rinse sprayer: install check valves at HW and CW connections.
- E. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- F. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- G. Install toilet seats on water closets.
- H. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- I. Install water supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.
- J. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- K. Install traps on fixture outlets as required.
- L. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
- M. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.
- N. Set shower receptors in leveling bed of cement grout. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for grout.

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

#### PLUMBING FIXTURES

- B. Connect water supplies from water distribution piping to fixtures.
- C. Connect drain piping from fixtures to drainage piping.
- D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
- E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

#### PLUMBING FIXTURES

### 3.4 FIELD QUALITY CONTROL

- A. Verify that installed fixtures are categories and types specified for locations where installed.
- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

### 3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.

### 3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
  - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
  - 2. Remove sediment and debris from drains.

### 3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities unless allowed in Division 1.

END OF SECTION 15410





## SECTION 15430 - PLUMBING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes plumbing specialties.
- B. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods"
  - 2. Division 15 Section "Meters and Gages"

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
  - 1. Domestic Water Piping: 125 psig.
  - 2. Sanitary Waste and Vent Piping: 10-foot head of water.

#### 1.4 SUBMITTALS

- A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
  - 1. Strainers.
  - 2. Cleanouts
  - 3. Sleeve penetration systems.
  - 4. In-line activated carbon cartridge filter.
- B. Field test reports.
- C. Maintenance Data: For plumbing specialties to include in maintenance manuals. Include the following:

#### 1.5 QUALITY ASSURANCE

### PLUMBING SPECIALTIES

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
- E. NSF Compliance: Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

## PART 2 - PRODUCTS

### 2.1 STRAINERS

- A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch round perforations, unless otherwise indicated.
  - 1. Pressure Rating: 125-psig minimum steam working pressure, unless otherwise indicated.
  - 2. NPS 2 and Smaller: Bronze body, with female threaded ends.
  - 3. NPS 2-1/2 and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.
  - 4. Y-Pattern Strainers: Screwed screen retainer with centered blow-down.
    - a. Drain: Field-installed, hose-end drain valve.
  - 5. Basket Strainers: Bolted flange or clamp cover, and basket with lift-out handle.
    - a. Type: Simplex with one basket.
    - b. Drain: Pipe plug.
- B. Drainage Basket Strainers: Non-pressure-rated, cast-iron or coated-steel body; with bolted flange or clamp cover and drain with plug.
  - 1. Basket: Bronze or stainless steel with 1/8- or 3/16-inch- diameter holes and lift-out handle.
  - 2. Female threaded ends for NPS 2 and smaller, and flanged ends for NPS 2-1/2 and larger.

### 2.2 MISCELLANEOUS PIPING SPECIALTIES

#### PLUMBING SPECIALTIES

- A. Open Drains: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting, joined with ASTM C 564, rubber gaskets.
- B. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.

## 2.3 SLEEVE PENETRATION SYSTEMS

- A. Manufacturers:
  - 1. ProSet Systems, Inc.
- B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.
  - 1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
  - 2. Stack Fitting: ASTM A 48, gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.
    - a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

## 2.4 ACTIVATED CARBON FILTER

- A. Spiral wound cartridge style activated carbon filter unit, equal to Keystone Filter Division Series 3000, Model 3121N:
  - 1. Maximum pressure: 150 psig.
  - 2. Continuous Flow rating: 4 gpm.
  - 3. Maximum operating temperature: 100 degrees Fahrenheit.
  - 4. Mounting configuration: In line.
  - 5. Housing Construction: NSF tested and certified.

## 2.5 CLEANOUTS

- A. Manufacturers
  - 1. Smith, Jay R. Mfg. Co.
  - 2. Zurn Industries, Inc., Specification Drainage Operation
  - 3. Zurn Industries, Inc., Jonespec Div
  - 4. Josam Co.
  - 5. Tyler Pipe, Wade Div.
  - 6. Watts Industries, Inc., Drainage Products Div.
- B. All cleanouts to have bronze countersunk rectangular slotted plugs lubricated with non-hardening thread lubricant. Flush-with-floor cleanout tops shall have non-skid covers. Flashing flange with device suffix (-F-C) required on membrane floors.

### PLUMBING SPECIALTIES

- C. Finished Room Floors: Smith No. 4020 cast iron adjustable floor level cleanout assembly with round nickel bronze top. Smith No. 4031 cast iron adjustable floor level cleanout assembly with round nickel bronze top with inverted hub and neoprene gasket.
- D. Unfinished Floors: Smith No. 4220 all cast iron adjustable floor level cleanout assembly with round heavy duty top. Smith No. 4231 all cast iron adjustable floor level cleanout assembly with round heavy duty top, inverted hub and neoprene gasket.

## 2.6 FLOOR DRAINS

- A. Floor Drains,: Comply with ASME A112.21.1M.
- B. Manufacturers
  - 1. Smith, Jay R. Mfg. Co.
  - 2. Zurn Industries, Inc., Specification Drainage Operation
  - 3. Zurn Industries, Inc., Jonespec Div
  - 4. Josam Co.
  - 5. Tyler Pipe, Wade Div.
  - 6. Watts Industries, Inc., Drainage Products Div.
- C. Toilet Room Floor Drains: Smith No. 2010(-A) cast iron drain and flashing collar with adjustable 5" diameter adjustable top, DU-CO finish. Provide 2" funnel attachment. Smith No. 2015(-A) for side outlet.

## 2.7 KEY OPERATION WALL HYDRANTS

- A. Manufacturers:
  - 1. Josam Co.
  - 2. Murdock, Inc.
  - 3. Simmons Manufacturing Co.
  - 4. Smith, Jay R. Mfg. Co.
  - 5. Tyler Pipe; Wade Div.
  - 6. Watts Industries, Inc.; Drainage Products Div.
  - 7. Woodford Manufacturing Co.
  - 8. Zurn Industries, Inc.; Jonespec Div.
  - 9. Zurn Industries, Inc.; Specification Drainage Operation.
- B. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig.
  - 1. Inlet: NPS 3/4 or NPS 1 threaded or solder joint.
  - 2. Outlet: ASME B1.20.7, garden-hose threads.
  - 3. Operating Keys: Two with each key-operation hydrant.
- C. Nonfreeze Exposed-Outlet Wall Hydrants: ASSE 1019, self-drainable with integral nonremovable hose-connection vacuum breaker, casing and operating rod to match wall thickness, projecting outlet, and wall clamp.
  - 1. Classification: Type A, for automatic draining with hose removed.
  - 2. Nozzle and Wall Plate Finish: Rough bronze.

### PLUMBING SPECIALTIES

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.
- C. Install expansion joints on vertical risers, stacks, and conductors if indicated.
- D. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
- E. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
- F. Install vent-flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
- G. Fasten recessed-type plumbing specialties to reinforcement built into walls.
- H. Install individual shutoff valve in each water supply to plumbing specialties. Use ball valve if specific valve is not indicated. Install shutoff valves in accessible locations.
- I. Install air vents at piping high points. Include ball valve in inlet.
- J. Install traps on plumbing specialty drain outlets.
- K. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipefittings.

### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect plumbing specialties to piping specified in other Division 15 Sections.
- D. Connect plumbing specialties and devices that require power according to Division 16 Sections.

### 3.3 PROTECTION

- A. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 15430

## PLUMBING SPECIALTIES



## SECTION 15450 - POTABLE-WATER STORAGE TANKS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes potable-water storage tanks and related specialties and accessories for indoor installations.
- B. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods" for dielectric fittings.
  - 2. Division 15 Section "Equipment Insulation" for field-installed tank insulation.

#### 1.3 DEFINITIONS

- A. The following are industry abbreviations for plastic materials:
  - 1. FRP: Fiberglass-reinforced plastic resin.
  - 2. HDPE: High-density polyethylene plastic.
  - 3. LDPE: Low-density polyethylene plastic.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Pressure Rating of Pressure-Type Water Tanks: At least 125 psig (860 kPa), unless otherwise indicated.
- B. Pressure Rating of Specialties and Accessories for Pressure Systems: At least 125 psig (860 kPa), unless otherwise indicated.
- C. Pressure Rating of Piping for Pressure Systems: At least 125 psig (860 kPa), unless otherwise indicated.
- D. Pressure Rating of Other Tanks and Piping Components: At least equal to system operating pressure.



## 1.5 SUBMITTALS

- A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories. Indicate dimensions, wall thicknesses, insulation, finishes and coatings, required clearances, methods of assembly of components, and piping connections.
- B. Manufacturer Certificates: For shop inspection and data reports as required by ASME Boiler and Pressure Vessel Code. Confirm successful pressure and leak testing.
- C. Manufacturer Certificates: Confirm successful pressure and leak testing.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements specified in "Field Quality Control" Article.

## 1.6 QUALITY ASSURANCE

- A. ASME Compliance for Steel Tanks: Fabricate and stamp steel, pressure water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels."
- B. ASME Compliance for Plastic Tanks: Fabricate and stamp plastic, pressure water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section X, "Fiber-Reinforced Plastic Pressure Vessels."
- C. NSF Compliance: NSF 14, "Plastics Piping Components and Related Materials," and NSF 61, "Drinking Water System Components--Health Effects." Include appropriate NSF marking.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Steel, Precharged, Diaphragm Water Storage Tanks:
    - a. Amtrol, Inc.
    - b. Armstrong Pumps, Inc.
    - c. Myers: F. E. Myers Co.
    - d. Smith: A. O. Smith; Aqua-Air Div.
    - e. State Industries.
    - f. Taco, Inc.
    - g. Wessels Co.

#### POTABLE WATER STORAGE TANKS

## 2.2 STEEL, PRECHARGED WATER STORAGE TANKS

- A. Description: Steel, vertical, pressured-rated water tank with air precharge.
- B. Operation: Factory-installed, butyl-rubber diaphragm.
- C. Construction: ASME code, steel, constructed with welded joints, for 125-psig (860-kPa) working pressure, and factory precharged to minimum system operating pressure at tank.
- D. Construction: Steel, constructed with welded joints, for 100-psig (690-kPa) working pressure, and factory precharged to minimum system operating pressure at tank.
- E. Tappings: Factory-fabricated steel, welded to tank before testing and labeling.
- F. Tappings: Factory-fabricated stainless steel, welded to tank before testing and labeling.
  - 1. NPS 2 (DN50) and Smaller: ASME B1.20.1, with female thread.
  - 2. NPS 2-1/2 (DN65) and Larger: ASME B16.5, flanged.
- G. Specialties and Accessories: Include air-charging connections, pressure relief valves, and pressure gages.
- H. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank before testing and labeling.
- I. Tank Exterior Surface Finish: Manufacturer's standard, unless finish is indicated.
- J. Tank Interior Finish: Materials and thicknesses complying with NSF 61 barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
  - 1. Lining Material: Polypropylene.
- K. Exterior Coating: Manufacturer's standard enamel paint.

## PART 3 - EXECUTION

### 3.1 WATER STORAGE TANK INSTALLATION

- A. Install water storage tanks on concrete bases, level and plumb, firmly anchored. Arrange so devices needing servicing are accessible.
  - 1. Install horizontal tanks on concrete piers and factory-fabricated saddles.
  - 2. Install horizontal tanks on fabricated steel supports and saddles.
- B. Anchor tank supports and tanks to substrate.

### 3.2 CONNECTIONS

- A. Install piping adjacent to water storage tanks to allow service and maintenance.
- B. Install thermometers and pressure gages on water storage tanks and piping, if indicated. Thermometers and pressure gages are specified in Division 15 Section "Meters and Gages."
- C. Connect water piping to water storage tanks with unions or flanges and with shutoff valves. Connect tank drains with shutoff valves and discharge over closest floor drains.
  - 1. General-duty valves are specified in Division 15 Section "Valves."
  - 2. Valves NPS 2 (DN50) and Smaller: Gate or ball.
  - 3. Valves NPS 2-1/2 (DN65) and Larger: Gate or butterfly.
  - 4. Drain Valves: NPS 3/4 (DN20) gate or ball valve. Include outlet with, or nipple in outlet with, ASME B1.20.7, 3/4-11.5NH thread for garden-hose service, threaded cap, and chain.
  - 5. Water Piping Connections: Make connections to dissimilar metals with dielectric fittings.
- D. Connect air piping to hydropneumatic tanks with unions or flanges and gate or ball valves. Make connections to dissimilar metals with dielectric fittings.
- E. Install the following devices on tanks:
  - 1. Pressure relief valves.
  - 2. Temperature-and-pressure relief valves.
  - 3. Vacuum relief valves. Include on tanks with copper interior lining unless tank has no valve.
  - 4. Tank vents on nonpressure tanks.
  - 5. Connections to accessories.

### 3.3 FIELD QUALITY CONTROL

- A. Pressure Testing: Hydrostatically test ASME code, water storage tanks to ensure structural integrity and freedom from leaks. Fill tanks with water, vent air, pressurize to 1-1/2 times tank pressure rating, disconnect test equipment, hold pressure for 30 minutes with no drop in pressure, and check for leaks. Replace tanks that fail test with new tanks and repeat until test is satisfactory.
- B. Pressure Testing: Hydrostatically test non-ASME code, pressure water storage tanks to ensure structural integrity and freedom from leaks at pressure of 50 psig (345 kPa) above system operating pressure, but not less than 150 psig (1035 kPa). Fill tanks with water, vent air, pressurize tanks, disconnect test equipment, hold pressure for two hours with no drop in pressure, and check for leaks. Repair or replace tanks that fail test with new tanks and repeat until test is satisfactory.
- C. Nonpressure Testing: Fill nonpressure water storage tanks to water operating level to ensure structural integrity and freedom from leaks. Hold water level for two hours with no drop in water level.

#### POTABLE WATER STORAGE TANKS

- D. Repair leaks and defects with new materials and retest system until results are satisfactory.
- E. Prepare written reports for specified tests.

### 3.4 CLEANING

- A. Clean and disinfect potable-water storage tanks.
- B. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, use procedure described in AWWA C652 or as described below:
  - 1. Purge water storage tanks with potable water.
  - 2. Disinfect tanks by one of the following methods:
    - a. Fill tanks with water/chlorine solution containing at least 50 ppm (50 mg/L) of chlorine. Isolate tanks and allow to stand for 24 hours.
    - b. Fill tanks with water/chlorine solution containing at least 200 ppm (200 mg/L) of chlorine. Isolate tanks and allow to stand for three hours.
  - 3. Flush tanks, after required standing time, with clean, potable water until chlorine is not present in water coming from tank.
  - 4. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination made by authorities having jurisdiction shows evidence of contamination.
- C. Prepare written reports for purging and disinfecting activities.

END OF SECTION 15450



## SECTION 15485 - ELECTRIC WATER HEATERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following electric water heaters:
  - 1. Light-commercial electric water heaters.
  - 2. Compression tanks.
  - 3. Water heater accessories.

#### 1.3 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Product Certificates: For each type of commercial electric water heater, signed by product manufacturer.
- D. Source quality-control test reports.
- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.
- G. Warranty: Special warranty specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

## 1.5 COORDINATION

- A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.

### 1. Failures include, but are not limited to, the following:

- a. Structural failures including storage tank and supports.
- b. Faulty operation of controls.
- c. Deterioration of metals, metal finishes, and other materials beyond normal use.

### 2. Warranty Period(s): From date of Substantial Completion:

#### a. Light-Commercial Electric Water Heaters:

- 1) Storage Tank: Three years.
- 2) Controls and Other Components: Three years.

#### b. Compression Tanks: One year.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 LIGHT-COMMERCIAL ELECTRIC WATER HEATERS

- A. Description: Comply with UL 174 for household, storage electric water heaters.

#### ELECTRIC WATER HEATERS

1. Manufacturers:
  - a. American Water Heater Company.
  - b. Bradford White Corporation.
  - c. Electric Heater Company (The); Hubbell Heaters Division.
  - d. GSW Water Heating Company.
  - e. Heat Transfer Products, Inc.
  - f. Lochinvar Corporation.
  - g. Rheem Water Heater Div.; Rheem Manufacturing Company.
  - h. Ruud Water Heater Div.; Rheem Manufacturing Company.
  - i. Smith, A. O. Water Products Company.
  - j. State Industries, Inc.
2. Storage-Tank Construction: Steel, vertical arrangement.
  - a. Tappings: ASME B1.20.1 pipe thread.
  - b. Pressure Rating: 150 psig.
  - c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
3. Factory-Installed Storage-Tank Appurtenances:
  - a. Anode Rod: Replaceable magnesium.
  - b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
  - c. Drain Valve: ASSE 1005.
  - d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
  - e. Jacket: Steel with enameled finish.
  - f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
  - g. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation, unless otherwise indicated.
  - h. Temperature Control: Adjustable thermostat for each element.
  - i. Safety Control: High-temperature-limit cutoff device or system.
  - j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
4. Capacity and Characteristics:
  - a. Capacity: 40 gal.
  - b. Recovery: 20 gph at 90 deg F temperature rise.
  - c. Heating Elements: 4.5 KW each.
  - d. Temperature Setting: 120 deg F.
  - e. Electrical Characteristics:
    - 1) Power Demand: 4.5 KW.
    - 2) Volts: 240V.
    - 3) Phases: One.
    - 4) Hertz: 60.



## 2.3 COMPRESSION TANKS

- A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

1. Manufacturers:

- a. AMTROL Inc.
- b. Armstrong Pumps, Inc.
- c. Flexcon Industries.
- d. Honeywell Sparco.
- e. Myers, F. E.; Pentair Pump Group (The).
- f. Smith, A. O.; Aqua-Air Div.
- g. State Industries, Inc.
- h. Taco, Inc.
- i. Watts Regulator Co.
- j. Wessels Co.

2. Construction:

- a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
- b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
- c. Air-Charging Valve: Factory installed.

3. Capacity and Characteristics:

- a. Working-Pressure Rating: 150 psig (1035 kPa).
- b. Capacity Acceptable: 4 gal. (15.1 L) minimum.

## 2.4 WATER HEATER ACCESSORIES

- A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

## 2.5 SOURCE QUALITY CONTROL

- A. Test and inspect water heater storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Prepare test reports.

## PART 3 - EXECUTION

### 3.1 WATER HEATER INSTALLATION

- A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- B. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- C. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 15 Section "Plumbing Specialties" for hose-end drain valves.
- D. Install thermometer on outlet piping of water heaters. Refer to Division 15 Section "Meters and Gages" for thermometers.
- E. Install thermometers on inlet and outlet piping of household, collector-to-tank, solar-electric water heaters. Refer to Division 15 Section "Meters and Gages" for thermometers.
- F. Install pressure gage(s) on inlet and outlet of water-heater piping. Refer to Division 15 Section "Meters and Gages" for pressure gages.
- G. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- H. Fill water heaters with water.
- I. Charge compression tanks with air.

### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.
- C. Ground equipment according to Division 16 Section "Grounding and Bonding."
- D. Connect wiring according to Division 16 Section "Conductors and Cables."

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.

#### ELECTRIC WATER HEATERS

2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

**END OF SECTION 15485**

**ELECTRIC WATER HEATERS**

**MAINE DEPARTMENT OF TRANSPORTATION  
KITTERY SCALE - SOUTHBOUND  
KITTERY, MAINE**

**15485-6**

## SECTION 15550 - BREECHINGS, CHIMNEYS, AND STACKS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. UL Listed double-wall with 1" insulation metal vent.

#### 1.3 SUBMITTALS

- A. Product Data: For the following:
  - 1. Listed double wall with 1" insulation metal vent.
- B. Warranties: Special warranties specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain listed system components through one source from a single manufacturer.
- B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

#### 1.5 COORDINATION

- A. Coordinate installation of equipment supports, and roof penetrations. These items are specified in Division 7.

#### 1.6 WARRANTY

- A. Warranty Period: 1 year from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 LISTED TYPE BREECHING AND CHIMNEY VENT

- A. Manufacturers:
  - 1. The Schebler Co.
  - 2. American Metal Products; AMPCO Inc., a MASCO Corporation.

3. Metal-Fab, Inc.
  4. Selkirk Inc.; Selkirk Metalbestos and Air Mate.
- B. Description: Design is based on Schebler, Model P1 Chimney Systems, Double-wall metal vents tested according to UL 103, listed as positive pressure capable, complying with NFPA 211. Shall be rated for 1000°F continuous and 1400 F intermittent.
- C. Construction: Inner shell and outer jacket separated by 1" ceramic fiber insulation.
- D. Inner Shell: 0.035" 20 ga. 304 stainless steel.
- E. Outer Jacket: 0.034" 20 ga. Aluminized steel.
1. Outer Jacket exposed to outside atmosphere shall be made of type 304 stainless steel.
- F. Accessories: All required accessories to make a complete system but not limited to the following; Tees, elbows, expansion joints, increasers, terminations cap, adjustable roof flashings, storm collars, wall support assemblies, wall guide assemblies, roof support assemblies, thimbles, stack base tee with drain fitting and cleanout cover, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
1. Stack Base Support: Split plate clamp flange and split plate, bolt assembly to manufacturer provided wall mounting bracket.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION OF LISTED VENTS AND CHIMNEYS

- A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.
- B. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.
- C. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.
- D. Slope breechings down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.
- E. Erect stacks plumb to finished tolerance of no more than 1 inch out of plumb from top to bottom.

#### BREECHINGS, CHIMNEYS AND STACKS

### 3.3 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.
- B. Clean breechings internally, during and after installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth and apply touchup finish to match factory or shop finish.
- C. Provide temporary closures at ends of breechings, chimneys, and stacks that are not completed or connected to equipment.

END OF SECTION 15550



## SECTION 15562 - INDIRECT-FIRED H&V UNITS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes indirect-fired HVAC units with the following accessories:
  - 1. LP Gas furnace.
  - 2. Dx cooling coil.
- B. Related Sections include the following:
  - 1. Division 15 Section "Breechings, Chimneys, and Stacks" for vent piping.

#### 1.3 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, and methods of field assembly, components, and location and size of each field connection. Prepare the following by or under the supervision of a qualified professional engineer:
  - 1. Vibration Isolation Details: Detail fabrication including attachments to structure and to supported equipment.
  - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Startup service reports.
- D. Operation and Maintenance Data: For indirect-fired H&V units to include in emergency, operation, and maintenance manuals.
- E. Warranty: Special warranty specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of indirect-fired HVAC units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."



- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. Comply with NFPA 70.

## 1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components listed below of indirect-fired HVAC units that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1. Des Champs Laboratories Incorporated; a unit of Entrodyne Corporation.
  - 2. Greenheck.
  - 3. Modine Mfg. Co.; Commercial HVAC&R Division.
  - 4. Trane Company (The); Unitary Products Group.

### 2.2 PACKAGED HVAC UNITS

- A. Upflow Induced Draft Furnace
  - Heavy gauge, wrap-around steel cabinet
  - Power Supply 115/1/60
  - ICS AFUE 80%
  - Multi-port In-Shot Burners
  - Integrated solid state control
  - Silicon Nitride ignitor
  - Complete front service access
  - Heavy gauge aluminized steel heat exchanger
  - Alternate bottom/left/right return air
  - Slide out blower assembly
  - Direct Drive, 4-speed motor
  - Blower door safety switch
  - Cleanable 1" high velocity filters
  - Selectable cooling fan off delay eliminates need for time delay relay
  - Insulated blower compartment
  - Left/Right gas connections
  - 24 volt fuse
  - Manual reset flame rollout switches
  - Separated combustion
  - Provide concentric flue kit by unit manufacturer

#### INDIRECT-FIRED H&V UNITS

- B. Convertible Cooling Coil:  
The cooling coil is convertible and can be applied vertical, upflow/downflow, or horizontal. The coil is fully cased and is designed for cooling application only. The coil shall be 3/8" [9.53 mm] seamless copper tubing mechanically bonded to aluminum plate fin. Refrigerant shall be controlled with factory installed check valve (FCCV). The refrigerant connections are brazed fittings. The coil includes a drain pan with drain connections. The splash guard auxiliary pan will not be required. The coil is capable of bi-directional airflow in order to keep refrigerant and drain fittings on the same side as furnace access doors when applied in horizontal mode. The coil is ARI certified with Trane's matching condensing unit.
- C. Provide the following factory installed options/accessories:  
5 Minute Delay Relay Kit to prevent rapid on-off compressor cycling in light load conditions by not allowing compressor to operate for 5 minutes upon shutdown.  
Indoor Fan Delay Relay to allow the indoor fan to continue to run a short time after the outdoor unit shuts off for increased cooling efficiency.  
LP Conversion Kit to will allow the use of liquified petroleum gas for heating.  
Concentric vent kit.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation of indirect-fired H&V units.
- B. Examine roughing-in for piping, ducts, and electrical systems to verify actual locations of connections before equipment installation.
- C. Examine roof curbs and equipment supports for suitable conditions where rooftop replacement-air units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install gas-fired units according to NFPA 54, "National Fuel Gas Code."
- B. Install suspended units from spring hangers with minimum 1-inch (25-mm) static deflection; refer to Division 15 Section "Mechanical Vibration and Seismic Controls."
- C. Install controls and equipment shipped by manufacturer for field installation with indirect-fired HVAC units.

#### 3.3 CONNECTIONS

- A. Piping Connections: Drawings indicate general arrangement of piping, fittings, and specialties. Install piping adjacent to machine to allow service and maintenance.

1. Gas Piping: Comply with requirements in Division 15 Section "Fuel Gas Piping." Connect gas piping with shutoff valve and union and with sufficient clearance for burner removal and service. Provide AGA-approved flexible connectors.
  2. Drain: Comply with requirements in Division 15 Section "Sanitary Waste and Vent Piping" for traps and accessories on piping connections to evaporative cooling units.
- B. Duct Connections: Duct installation requirements are specified in Division 15 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to indirect-fired H&V units with flexible duct connectors. Flexible duct connectors are specified in Division 15 Section "Duct Accessories."
- C. Ground equipment according to Division 16 Section "Grounding and Bonding."
- D. Connect wiring according to Division 16 Section "Conductors and Cables."
- ### 3.4 STARTUP SERVICE
- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
1. Inspect for visible damage to furnace combustion chamber.
  2. Inspect casing insulation for integrity, moisture content, and adhesion.
  3. Verify that clearances have been provided for servicing.
  4. Verify that controls are connected and operable.
  5. Verify that filters are installed.
  6. Purge gas line.
  7. Inspect and adjust vibration isolators.
  8. Verify bearing lubrication.
  9. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
  10. Adjust fan belts to proper alignment and tension.
  11. Start unit according to manufacturer's written instructions.
  12. Complete startup sheets and attach copy with Contractor's startup report.
  13. Inspect and record performance of interlocks and protective devices; verify sequences.
  14. Operate unit for run-in period recommended by manufacturer.
  15. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency:
    - a. Gas Burner:
      - 1) Measure gas pressure at manifold.
      - 2) Measure combustion-air temperature at inlet to combustion chamber.
      - 3) Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
  16. Calibrate thermostats.
  17. Adjust and inspect high-temperature limits.
  18. Inspect dampers, if any, for proper stroke and interlock with return-air dampers.

#### INDIRECT-FIRED H&V UNITS

19. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
  20. Measure and record airflow. Plot fan volumes on fan curve.
  21. Verify operation of remote panel, including pilot-operation and failure modes. Inspect the following:
    - a. High-limit heat.
    - b. Alarms.
  22. After startup and performance testing, change filters, verify bearing lubrication, and adjust belt tension.
- C. Remove and replace malfunctioning components that do not pass tests and inspections and retest as specified above.
- D. Prepare written report of the results of startup services.
- 3.5 ADJUSTING
- A. Adjust initial temperature set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 15562



## SECTION 15671 – AIR COOLED CONDENSING UNITS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes Air-cooled condensing units.
- B. Related Sections include the following:
  - 1. Division 15 Section "Refrigerant Piping" for valves and accessories for piping connections to units.

#### 1.3 SUBMITTALS

- A. Product Data: Include rated capacities; shipping, installed, and operating weights; dimensions; required clearances; methods for assembling components; furnished specialties; accessories; and installation and startup instructions for each model indicated.
- B. Refrigerant piping schematic; Size piping and design the actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes, to ensure proper operation and compliance with warranties of connected equipment.
- C. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- E. Maintenance Data: For each condensing unit to include in the maintenance manuals specified in Division 1. Include a parts list for each condensing unit, control, and accessory; troubleshooting maintenance guide; and servicing and preventive maintenance procedures and schedule.
- F. Warranties: Special warranties specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Listing and Labeling: Provide electrically operated equipment specified in this Section that is listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

- B. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- C. Comply with NFPA 70.
- D. Comply with UL 303, "Refrigeration and Air-Conditioning Condensing and Compressor Units."

#### 1.5 COORDINATION

- A. Coordinate size and location of concrete housekeeping bases. Cast anchor-bolt inserts into pad. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. Roof specialties are specified in Division 7.

#### 1.6 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Compressor Warranty: A written warranty, executed by Contractor and signed by manufacturer, agreeing to replace components that fail in materials and workmanship within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed. Warranty Period: not less than 5 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide condensing units by one of the following:
  1. Condensing Units, Air Cooled, 1 to 5 Tons:
    - a. Trane Co. (The); North American Commercial Group.
    - b. Carrier Corp.; Carrier Air Conditioning Div.
    - c. York International Corp.

#### 2.2 CONDENSING UNITS, AIR COOLED, 1 TO 6 TONS

- A. Description: Factory assembled and tested, air-cooled; consisting of compressors, condenser coils, fans, motors, refrigerant reservoirs, and operating controls.

#### AIR COOLED CONDENSING UNITS

- B. Compressor: The compressor shall have internal over temperature and pressure protection, and total dipped hermetic motor windings. Provide roto-lock suction and discharge refrigerant connections, and centrifugal oil pump.
- C. Condenser: Copper-tube, aluminum-fin coil, with liquid sub-cooler.
- D. Refrigeration circuit: Refrigeration system controls include condenser fan and compressor contactor. High and low pressure protection shall be inherent to the compressor. A factory installed liquid line drier and low-pressure switch shall be provided. Field braze connections shall be externally accessible, with multi-use liquid and gas line valves with service pressure gauge ports.
- E. Provide operating charge of R22.
- F. Condenser Fan: Direct-drive, aluminum propeller fan; with permanently lubricated fan motor with thermal-overload protection.
- G. Accessories include the following:
  - 1. Pre-charged and insulated suction and liquid tubing.
  - 2. Low ambient kit to permit operation down to 45 deg F.
  - 3. Crankcase heater.
  - 4. Automatic reset timer to prevent compressor rapid cycle.
  - 5. Polyethylene mounting base to provide a permanent foundation.
- H. Casing: Steel, finished with baked enamel; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gage ports on exterior of casing.

## 2.3 SOURCE QUALITY CONTROL

- A. All condensing units shall be U.L. Listed.
- B. Verification of Performance: Rate condensing units according to ARI.
- C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- D. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install condensing units according to manufacturer's written instructions.
- B. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.



- C. Install ground-mounted units on 4-inch- thick, reinforced concrete base, 4 inches larger than condensing unit on each side. Concrete, reinforcement, and formwork requirements are specified in Division 3. Coordinate installation of anchoring devices.
- D. Install roof-mounted units on equipment supports specified in Division 7. Anchor unit to supports with removable fasteners.
- E. Install units on spring isolators.

### 3.2 CONNECTIONS

- A. Connect pre-charged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.
- B. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories.
- C. Ground equipment.
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.3 FIELD QUALITY CONTROL

- A. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks and replace lost refrigerant and oil.
- B. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
  - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units with new units and retest.

### 3.4 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Clean units to remove dirt and construction debris and repair damaged finishes.

### 3.5 COMMISSIONING

- A. Verify that units are installed and connected according to the Contract Documents.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
  - 1. Inspect for physical damage to unit casing.
  - 2. Verify that access doors move freely and are weather-tight.
  - 3. Clean units and inspect for construction debris.

#### AIR COOLED CONDENSING UNITS

4. Check that all bolts and screws are tight.
  5. Adjust vibration isolation and flexible connections.
  6. Verify that controls are connected and operational.
- C. Lubricate bearings on fans.
- D. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
- E. Adjust fan belts to proper alignment and tension.
- F. Start unit according to manufacturer's written instructions.
1. Complete manufacturer's starting checklist.
- G. Measure and record airflow over coils.
- H. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- I. After startup and performance test, lubricate bearings and adjust belt tension.

### 3.6 DEMONSTRATION

- A. Startup Services: Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
  2. Review data in the maintenance manuals.
  3. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

END OF SECTION 15671



## SECTION 15762 - ELECTRIC RADIATORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Baseboard radiators.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For electric radiators to include in maintenance manuals.
- F. Warranties: Special warranties specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## 1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric radiators that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period (Baseboard Heating Element): 10 years from date of Substantial Completion.
  - 2. Warranty Period (Electronic Thermostat): Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.2 BASEBOARD RADIATORS

- A. Manufacturers:
  - 1. Chromalox; Division of Emerson Electric Company.
  - 2. Marley Electric Heating; a United Dominion Company.
  - 3. Ouellet Canada Inc.
- B. Heating Elements: Nickel-chromium heating wire element enclosed in metallic sheath mechanically expanded into fins, with high-temperature cutout. Element supports eliminate thermal expansion noise.
- C. Enclosures: One piece, minimum 0.030-inch- (0.75-mm-) thick steel, with full-height back, full-length damper, end panel, end caps, corners, and joiner pieces to snap together. Front panel shall be easily removable.
  - 1. Enclosure Height: 7 inches (175 mm).
  - 2. Finish: Factory-applied baked enamel in color selected by Architect from manufacturer's standard colors.
  - 3. Element Brackets: Galvanized steel to support front panel and element glide.
- D. Unit Controls: Remote line-voltage thermostat provided by unit manufacturer and installed under this section.

#### ELECTRIC RADIATORS

E. Accessories:

1. Blank sections.
2. Convenience receptacles complying with NEMA WD 6, Configuration 5-15R.

F. Capacity: 200 W. per linear ft.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for electric radiators to verify actual locations of electrical connections before equipment installation.
- B. Examine walls for suitable conditions where electric radiators will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install electric baseboard level and plumb and according to the following, unless otherwise indicated:
  1. Join sections with manufacturer's splicer, plates, and filler pieces to provide continuous cabinet.
  2. Install manufacturer's access fitting in cabinets for access to electrical connections, controls, and other fittings.
  3. Terminate enclosures with manufacturer's end caps.

### 3.3 CONNECTIONS

- A. Ground equipment according to Division 16 Section "Grounding and Bonding."
- B. Connect wiring according to Division 16 Section "Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.4 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing and prepare test reports:
  1. Operate electric heating elements through each stage to verify proper operation and electrical connections.

## ELECTRIC RADIATORS

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 15762

## SECTION 15766 - UNIT HEATERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods" for general motor requirements.

#### 1.2 SUMMARY

- A. This Section includes unit heaters.

#### 1.3 SUBMITTALS

- A. Product Data: Include specialties and accessories for each unit type and configuration.
- B. Shop Drawings: Submit the following for each unit type and configuration:
  - 1. Plans, elevations, sections, and details.
  - 2. Details of anchorages and attachments to structure and to supported equipment.
  - 3. Power, signal, and control wiring diagrams. Differentiate between manufacturer-installed and field-installed wiring.
  - 4. Equipment schedules to include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. Field Test Reports: Written reports of tests specified in Part 3 of this Section.
- E. Maintenance Data: For unit heaters to include in maintenance manuals specified in Division 1. Include the following:
  - 1. Maintenance schedules and repair parts lists for motors, coils, integral controls, and filters.

#### UNIT HEATERS



#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70; Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

#### 1.5 COORDINATION

- A. Coordinate layout and installation of unit heaters and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- B. Coordinate wall construction and conditions with recessed or semi-recessed cabinet unit heater installation requirements.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Carrier Corp.
  - 2. Dunham-Bush, Inc.
  - 3. McQuay International.
  - 4. Trane Company (The); North American Commercial Group.
  - 5. Sterling
  - 6. York
  - 7. Vulcan

#### 2.2 UNIT HEATERS (LP GAS FIRED)

- A. High Efficiency Propeller Fan Gas Unit Heaters
  - 1. Units shall be completely factory assembled, piped, wired, and test fired. All units shall be AGA Certified, 80 percent efficient and conform with the latest ANSI Standards for safe and efficient performance. Units are provided with two-point suspension hangers on propeller fan unit heaters and with four-point suspension hangers on centrifugal fan unit heaters. Unit shall be propane gas fired.
  - 2. Casings shall be die-formed, 20-gauge galvanized steel and finished in baked enamel. The bottom panel shall be easily removed to provide service access to the burners, pilot and orifice. Provide independently adjustable horizontal louvers with stops to prevent total closure.
  - 3. Standard heat exchanger construction shall consist of seam welded 20-gauge aluminized steel tubes and 18-gauge aluminized steel headers.
  - 4. Burners shall be die-formed, corrosion resistant aluminized steel, with stainless steel port protectors. Provide port protectors to prevent scale or foreign matter from obstructing the burner ports. Burners shall be individually removable for ease of inspection and servicing. Each burner shall be individually adjustable.

#### UNIT HEATERS

5. Unit shall incorporate propeller fan blades constructed of aluminum with an aerodynamic contour. All fans shall be dynamically balanced for quiet, efficient operation and supplied with a protective type fan guard. Provide rubber-in-shear isolators for isolation between the fan/motor combination and the unit heater casing.
6. Motors shall be 115V, 60 Hz, single-phase open drip-proof with built-in thermal overload protection and permanently lubricated bearings.
7. A factory installed junction box shall be provided for all power connections. Provide a 24V combination single-stage redundant gas valve, consisting of a combination pilot solenoid valve, automatic electric gas valve, pilot filter, pressure regulator, pilot adjustment and manual shutoff. A flue vent fan relay and combustion air proving switch shall also be provided as standard. Provide spark-ignited intermittent pilot system with electronic flame supervision. A 24V control transformer, high limit and fan time delay relay shall be provided. The fan time delay relay shall delay the fan start until the heat exchanger reaches a predetermined temperature. The fan shall operate only after burner shutdown, removing residual heat from the heat exchanger.
8. Flue Vent Fan: Provide flue vent fan for power venting, factory assembled to a sealed flue collection chamber.
9. Provide the following factory installed options:
  - a. Two-Stage Gas Valve to provide two stages of heat. Ignition at low fire shall be 50 percent of the furnaces rated input. Provide a two-stage room thermostat to maintain space temperature.
  - b. Provide OSHA Fan Guards .
  - c. High Gas Line Pressure Regulator to reduce main gas line pressure to a minimum of seven-inches W.C. Pressure at the jobsite is 2 psig.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas to unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before cabinet unit heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install unit heaters level and plumb.
- B. Install unit heaters to comply with NFPA 90A.
- C. Hung unit heaters shall be suspended from structure with rubber-in-shear vibration isolators (rubber hangers).
- D. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Thermostat shall be supplied by the unit manufacturer.

### UNIT HEATERS

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Unless otherwise indicated, install shutoff valve and union or flange at each connection.
- C. Install piping adjacent to machine to allow service and maintenance.
- D. Ground equipment.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.4 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing and report results in writing:
  - 1. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 2. Test and adjust controls and safeties.
- B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

### 3.5 CLEANING

- A. After installing units, inspect unit cabinet for damage to finish. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. After installing units, clean unit heaters internally according to manufacturers written instructions.

END OF SECTION 15766

## SECTION 15815 - METAL DUCTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 3-inch wg.
- B. Related Sections include the following:
  - 1. Division 7 for fire-resistant sealants for use around duct penetrations and fire-damper installations in fire-rated floors, partitions, and walls.
  - 2. Division 15 Section "Basic Mechanical Materials and Methods"
  - 3. Division 15 Section "Mechanical Insulation" for duct insulation.
  - 4. Division 15 Section "Diffusers, Registers, and Grilles."
  - 5. Division 15 Section "Control Systems Equipment" for automatic volume-control dampers and operators.
  - 6. Division 15 Section "Testing, Adjusting, and Balancing" for air balancing and final adjusting of manual-volume dampers.

#### 1.3 SYSTEM DESCRIPTION

- A. Drawings show the general layout of ductwork and accessories but do not show all required fittings and offsets that may be necessary to connect ducts to equipment, boxes, diffusers, grilles, etc., and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets. Coordinate with other trades for space available and relative location of HVAC equipment and accessories on ceiling grid. Duct sizes on the drawings are inside dimensions, which maybe altered by Contractor to other dimensions with the same air handling characteristics where necessary to avoid interferences and clearance difficulties.

#### 1.4 SUBMITTALS

- A. Product Data: For duct sealing materials.
- B. Louvers
  - 1. Product Data: For each type of product indicated. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

#### METAL DUCTS

2. Color Chart for Initial Selection: For units with factory-applied color finishes.
3. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

C. Product Data: For the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Duct-mounted access doors and panels.
4. Flexible ducts.

D. Ductwork:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Duct layout indicating pressure classifications and sizes on plans.
3. Fittings.
4. Reinforcement and spacing.
5. Seam and joint construction.
6. Penetrations through fire-rated and other partitions.
7. Hangers and supports, including methods for building attachment and duct attachment.

E. Welding Certificates: Copies of certificates indicating welding procedures and personnel comply with requirements in "Quality Assurance" Article.

F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

G. Louver Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

H. Louvers shall comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

I. The contractor must comply with the enclosed specification in its entirety. If on inspections, the engineer finds changes have been made without prior written approval, the contractor will make the applicable changes to comply with this specification, at the contractor's expense.

J. At the discretion of the engineer, sheet metal gauges, and reinforcing may be randomly checked to verify all duct construction is in compliance.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and fire stopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

### METAL DUCTS

- B. Store and handle sealant and fire stopping materials according to manufacturer's written recommendations.
- C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation.
- D. All ductwork and fittings delivered and stored on the job site must be capped to prevent the entry of moisture, construction dust or other debris.

## PART 2 - PRODUCTS

### 2.1 SHEET METAL MATERIALS

- A. Galvanized, Sheet Steel, normal service: Lock-forming quality; ASTM A 653, G60 or better.
- B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

### 2.2 SEALANT MATERIALS

- A. Joint Sealant/Mastic: Shall be flexible, water-based, adhesive sealant designed for use in all pressure duct systems. After curing, it shall be resistant to ultraviolet light and shall prevent the entry of water, air and moisture into the duct system. Sealer shall be UL 723 listed and meet NFPA requirements for Class 1 ductwork. Ductmate PROseal or approved equal.
  - 1. Maximum 25 flame spread and 50 smoke developed (dry state) compounded specifically for sealing ductwork as recommended by the manufacturer.
  - 2. Generally provide liquid sealant for low clearance slip joints and heavy, permanently elastic, mastic type where clearances are larger.
- B. Flange Gasket: A butyl rubber gasket which complies with UL Standard 181 and 723 testing and meets Mil-C 18969B and TTS-S-001657. This material, in addition to the above, shall not contain vegetable oils, fish oils, or any other type vehicle that will support fungal and/or bacterial growth. Approved: Ductmate 440 Butyl gasket tape.

### 2.3 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for building materials.
  - 1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
  - 2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.

## METAL DUCTS

1. Hangers Installed in Corrosive Atmospheres: Electro galvanized, all-thread rod or galvanized rods with threads painted after installation.
  2. Straps and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.
  2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
  3. Supports for Aluminum Ducts: Aluminum support materials, unless materials are electrolytically separated from ductwork.

## 2.4 RECTANGULAR DUCT FABRICATION

- A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
  2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
  3. Maximum allowable deflection for transverse joints and intermediate reinforcements will not exceed 0.250 inch.
  4. Longitudinal Seams: Pittsburgh lock shall be used on all longitudinal seams. Snap-lock seams are not acceptable.
  5. If SMACNA seal class A or B is specified, the longitudinal seam shall be sealed from the inside.
- B. Slide-on Transverse Joint Connectors: Prefabricated slide-on transverse duct connectors and components will be accepted. Duct constructed using prefabricated systems will refer to the manufacturer guidelines for sheet gauge, intermediate reinforcement size and spacing, and proper joint reinforcement(s). Approved connection systems: Ductmate Industries: or W.D.C.I.
- C. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:
1. Supply Ducts: 3-inch wg.
  2. Return Ducts: 2-inch wg, negative pressure.
  3. Exhaust Ducts: 2-inch wg, negative pressure.
- D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of un-braced panel area, unless ducts are lined. All large ducts must be braced as required to prevent drumming.
- E. Fittings per SMACNA acceptable, specific fittings requirements below:
1. Fig. 2-3 Rectangular Elbows: Type RE2 square throat with vanes or Type RE1 radius.

### METAL DUCTS

2. Fig. 2-5 Rectangular Divided Flow Branches: Type 1, Type 2, Type 4A, or 4B.
3. Fig. 2-6 Branch Connections: 45-degree entry, 45-degree lead-in, bell-mouth, or spin-in.
4. Fig. 2-7 Offsets and Transitions. Use gradual offsets as shown, 90-degree offsets shall be avoided.
5. Fig. 2-8 Obstructions
6. Fig 2-9 Duct Coils: Hot water heating coils with transitions and access door as shown.

## 2.5 ROUND DUCT FABRICATION

- A. Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" latest edition.
- B. Round ducts shall be as follows:
  1. Exposed Round Ducts: Shall be Spiral Seam (RL-1 seam) at 2-inch wg construction.
  2. Concealed Round Ducts: Shall be longitudinal Grooved Seam Flat lock (RL-5 seam) at 2-inch wg construction.
  3. Snap lock seams *shall not* be used for this project.
- C. Round Joints:
  1. Up to 20" diameter: Interior slip coupling beaded at center and fastened to duct with screws shall be used to join ducts. Seal joint with an approved sealing compound, continuously applied around joint prior to assembling and after fastening, making certain that majority of sealant resides on interior of the joint.

## 2.6 ROUND DUCT FITTING FABRICATION

- A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal seam straight duct.
- B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from body onto branch tap entrance.
- C. Elbows: Diameters 3 through 8 inches shall be two section die stamped, all others shall be gored construction, maximum 18 degree angle, with all seams continuously welded or standing seam. Coat galvanized areas of fittings damaged by welding with corrosion resistant aluminum paint or galvanized repair compound.

## 2.7 BACKDRAFT DAMPERS

- A. Description: Ruskin BD2/A2.
- B. Frame: 0.090-inch- thick extruded aluminum, with mounting flange.
- C. Blades: 0.025-inch- thick, roll-formed aluminum.
- D. Blade Seals: Extruded-vinyl.
- E. Bearings: Zytel.

### METAL DUCTS



F. Tie Bars and Brackets: Aluminum.

G. Return Spring: Adjustable tension.

## 2.8 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classifications of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

C. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

D. Jackshaft: 1-inch- diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.

E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

## 2.9 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

1. Turning vanes shall be Harper double wall turning vanes fabricated from the same material as the duct. Mounting rails shall have friction insert tabs that align the vanes automatically.

2. Tab spacing shall be as specified in Figure 2-3 of the 1995 SMACNA Manual, "HVAC Duct Construction Standards, Metal & Flexible" Second Edition standard. Rail systems with non-standard tab spacing shall not be accepted.

3. Due to tensile loading, vanes shall be capable of supporting 250 pounds when secured according to the manufacturers instructions.

B. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

## 2.10 DUCT-MOUNTED ACCESS DOORS AND PANELS

### METAL DUCTS

- A. Provide access doors of adequate size to allow easy access to the equipment that will require maintenance. Provide insulated or acoustical lined doors where duct is of the same construction.
- B. Systems designed for 3" w.g. and less (SMACNA Seal Class B or C) shall utilize a hinged, cam or hinged & cam, square-framed access door.
- C. Systems designed for 4" w.g. and above (SMACNA Seal Class A) shall utilize a sandwich-type access door. Construct doors in accordance with Figure 2-10 of the 1995 SMACNA Manual, "HVAC Duct Construction Standards, Metal & Flexible" Second Edition.
- D. Manufacturer to provide an installed neoprene gasket around perimeter of access door for airtight seal.
- E. Kitchen exhaust ducts shall have field fabricated access doors of same material and thickness as duct or U L listed manufactured doors.
- F. Acceptable manufacturers: Ductmate Industries, Inc. or approved equal

#### 2.11 FLEXIBLE CONNECTORS

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.
- C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.
- D. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 4-3/8-inch- wide, 0.028-inch- thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.
- E. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene or neoprene.
  - 1. Minimum Weight: 26 oz./sq. yd..
  - 2. Tensile Strength: 480 lbf/inch in the warp, and 360 lbf/inch in the filling.

#### 2.12 FLEXIBLE DUCTS

- A. General: Comply with UL 181, Class 1.
- B. Flexible Ducts, Un-insulated: Spiral-wound steel spring with flameproof vinyl sheathing.
- C. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- thick (R = 6.0), glass-fiber insulation around a continuous inner liner.

#### METAL DUCTS

1. Reinforcement: Steel-wire helix encapsulated in inner liner.
2. Outer Jacket: Polyethylene film.
3. Inner Liner: Polyethylene film.

D. Pressure Rating: 6-inch wg positive, 1/2-inch wg negative.

## 2.13 ACCESSORY HARDWARE

- A. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## PART 3 - EXECUTION

### 3.1 DUCT INSTALLATION, GENERAL

- A. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.
- B. Construct and install each duct system for the specific duct pressure classification indicated.
- C. Install G60 galvanized ductwork for all interior installations.
- D. Install ducts in lengths not less than 12 feet, unless interrupted by fittings.
- E. Install ducts with fewest possible joints.
- F. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
- G. Install couplings tight to duct wall surface with a minimum of projections into duct.
- H. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
- I. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- J. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- K. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.
- L. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- M. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

## METAL DUCTS

- N. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.
- O. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Firestopping materials and installation methods are specified in Division 7.

### 3.2 DUCT ACCESSORIES INSTALLATION

- A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible".
- B. Provide duct transitions, offsets and connections to dampers, coils, and other equipment in accordance with SMACNA Standards
- C. Perform the following as directed by the controls contractor:
  - 1. Installation of:
    - a. Automatic control dampers.
    - b. Necessary blank off plates.
  - 2. Access doors where and as required.
- D. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from fire dampers and all other components that require servicing.
  - 1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining per equipment manufacturers' requirements.
  - 2. Install access panels on side of duct where adequate clearance is available.

### 3.3 CONTROL DAMPER INSTALLATION

- A. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.
- B. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure 1/4 in. larger than damper dimensions and shall be square, straight, and level.
- C. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 1/8 in. of each other.
- D. Follow the manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.

#### METAL DUCTS

- E. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to ensure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
- F. Provide a visible and accessible indication of damper position on the drive shaft end.
- G. Support ductwork in area of damper when required to prevent sagging due to damper weight.
- H. After installation of low-leakage dampers with seals, caulk between frame and duct opening to prevent leakage around perimeter of damper.

### 3.4 SEAM AND JOINT SEALING

- A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Pressure Classification Less Than 2-Inch wg: Transverse joints.
- C. Seal externally insulated ducts before insulation installation.

### 3.5 HANGING AND SUPPORTING

- A. Install duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16 feet and at each floor.
- D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- E. Install concrete inserts before placing concrete.
- F. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

### 3.6 CONNECTIONS

- A. Connect equipment with flexible connectors according to Division 15 Section "Duct Accessories."
- B. For branch, outlet and inlet, and terminal unit connections, comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

### 3.7 ADJUSTING

- A. Adjust volume-control dampers in ducts, outlets, and inlets to achieve design airflow.
- B. Adjust duct accessories for proper settings.

## METAL DUCTS

Refer to Division 15 Section "Testing, Adjusting, and Balancing" for detailed procedures.

### 3.8 CLEANING

- A. HVAC systems shall not be operated during construction.
- B. All ductwork shall be provided with temporary enclosures to keep the HVAC system free of dust and construction debris. The HVAC system includes any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts to the air handling unit (AHU or RTU), the interior surfaces of the AHU/RTU, mixing box, coil compartment, condensate drain pans, supply air ducts, fans, fan housing, fan blades, turning vanes, filters, filter housings, reheat coils, VAV boxes, and supply diffusers are all considered part of the HVAC system. The HVAC system may also include other components such as dedicated exhaust and ventilation components and make-up air systems.
- C. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean; however, the **owner** reserves the right to further verify system cleanliness through Surface Comparison Testing or the NADCA vacuum test specified in the NADCA standards. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be cleaned and subjected to re-inspection for cleanliness.
- D. If cleaning is required, the procedures of the National Air Duct Cleaners Association (NADCA) General Specifications For The Cleaning Of Commercial Heating, Ventilating And Air Conditioning Systems (<http://www.nadca.com/standards/standards.asp>) shall be followed. All costs of this work shall be borne by Division 15.

END OF SECTION 15815



## SECTION 15838 - POWER AND GRAVITY VENTILATORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods" for general motor requirements.

#### 1.2 SUMMARY

- A. This Section includes the following:

- 1. Ceiling-mounting ventilators.
  - 2. Gravity roof ventilators.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base air ratings on sea-level conditions.
- B. Operating Limits: Classify according to AMCA 99.

#### 1.4 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
  - 1. Certified fan performance curves with system operating conditions indicated.
  - 2. Certified fan sound-power ratings.
  - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 4. Material gages and finishes, including color charts.
  - 5. Dampers, including housings, linkages, and operators.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
  - 2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

#### POWER AND GRAVITY VENTILATORS



3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.
- C. Coordination Drawings: Show roof penetration requirements and reflected ceiling plans drawn to scale and coordinating roof penetrations and units mounted above ceiling. Show the following:
1. Roof framing and support members relative to duct penetrations.
  2. Ceiling suspension assembly members.
  3. Size and location of initial access modules for acoustical tile.
  4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- D. Maintenance Data: For power ventilators to include in maintenance manuals specified in Division 1.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal for sound and air performance.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- D. UL Standard: Power ventilators shall comply with UL 705.
- E. For restaurant applications, fan shall be listed by Underwriters Laboratories (UL 762)

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

#### 1.7 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

#### POWER AND GRAVITY VENTILATORS

- C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cook
  2. JennFan
  3. New York Blower Company
  4. Penn Ventilation Companies, Inc.
  5. Acme Engineering & Mfg. Corp.
  6. Greenheck Fan Corp.
  7. Hartzell Fan, Inc.

### 2.2 CEILING-MOUNTING VENTILATORS

- A. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.
- B. Housing: Steel, lined with acoustical insulation.
- C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- D. Grille: Plastic, louvered grille with flange on intake and thumbscrew attachment to fan housing.
- E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- F. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent.
  2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
  3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
  4. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
  5. Isolation: Rubber-in-shear hanging vibration isolators.
  6. Galvanized steel wall cap, with ½" bird screen, and transition fittings.
  7. Aluminum wall cap, with ½" bird screen, and transition fittings.
  8. Painted steel, sloped roof jack for a weather-tight discharge for sloped-roof installations. Complete with integral flashing, backdraft damper, bird screen, and black epoxy finish.
  9. Aluminum eave elbow.
  10. Curb-mount roof cap with 12" high roof curb.
  11. Brick vent with extruded aluminum blades.

## POWER AND GRAVITY VENTILATORS

## 2.3 MOTORS

- A. Refer to Division 15 Section "Motors" for general requirements for factory-installed motors.
- B. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.
- C. Enclosure Type: Open dripproof.

## 2.4 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

## 2.5 GRAVITY ROOF VENTILATORS

- A. Unit shall be a hooded aluminum, roof mounted gravity intake ventilator as required for each specific application.
- B. Shall be manufactured at an ISO 9001 certified facility.
- C. The unit shall be of bolted and welded construction utilizing corrosion resistant fasteners. The aluminum hood shall be constructed of minimum 14 gauge marine alloy aluminum, bolted to a minimum 8 gauge aluminum support structure. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. Birdscreen constructed of 1/2" mesh shall be mounted across the relief opening. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.
- D. Accessories:
  - 1. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
  - 2. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
  - 3. Configuration: Self-flashing without a cant strip, with mounting flange.
  - 4. Overall Height: 9-1/2 inches.
  - 5. Pitch Mounting: Manufacture curb for roof slope. Coordinate with Division 7 as required.
  - 6. Metal Liner: Galvanized steel.
- E. Ventilators shall be equal to Cook Manufacturer:
  - 1. **Model VI** (Intake) with maximum pressure drop of 0.10 inches w.g.
- F. Dimensions shown on drawings are clear area throat dimensions.

### POWER AND GRAVITY VENTILATORS

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- C. Install units with clearances for service and maintenance.
- D. Label units according to requirements specified in Division 15 Section "Mechanical Identification."

### 3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.

### 3.3 FIELD QUALITY CONTROL

- A. Equipment Startup Checks:
  - 1. Verify that shipping, blocking, and bracing are removed.
  - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
  - 3. Verify that cleaning and adjusting are complete.
  - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  - 5. Verify lubrication for bearings and other moving parts.
  - 6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
  - 7. Disable automatic temperature-control operators.
- B. Starting Procedures:
  - 1. Energize motor and adjust fan to indicated rpm.
  - 2. Measure and record motor voltage and amperage.
- C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

## POWER AND GRAVITY VENTILATORS

- E. Shut unit down and reconnect automatic temperature-control operators.
- F. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.
- G. Replace fan and motor pulleys as required to achieve design airflow.
- H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

#### 3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Lubricate bearings.

#### 3.5 CLEANING

- A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.
- B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

END OF SECTION 15838

## SECTION 15855 - DIFFUSERS, REGISTERS, AND GRILLES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.
- B. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods"
  - 2. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.
  - 3. Division 15 Section "Testing, Adjusting, and Balancing" for balancing diffusers, registers, and grilles.

#### 1.3 DEFINITIONS

- A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.
- B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.
- C. Register: A combination grille and damper.

#### 1.4 SUBMITTALS

- A. Product Data: For each model indicated, include the following:
  - 1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
  - 2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
  - 3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
  - 4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

### DIFFUSERS, REGISTERS AND GRILLES

- B. Coordinate locations with reflected ceiling plans and wall elevations as applicable.

## 1.5 QUALITY ASSURANCE

- A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, and grilles and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
- B. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED UNITS

- A. Diffusers, registers, and grilles are scheduled on Drawings.
- B. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."
- C. Typical Return/Exhaust Grille TITUS Model 350 Series
  - 1. Return/Exhaust Grille, 35-degree angle fixed horizontal blades, 3/4" spacing; surface-mount or lay-in as scheduled; Steel (Titus 350RL) or Aluminum (Titus 350FL). Register version: provide with opposed blade damper.
- D. Square ceiling diffusers shall be TITUS Model TMS (steel) or TMS-AA (aluminum with steel support bar) of the sizes and mounting types shown on the plans and outlet schedule. The TMS and TMS-AA models shall have three cones, which give a uniform face size and appearance when different neck sizes are used in the same area. All cones shall be one piece precision die-stamped; the back cone shall also include an integrally drawn inlet (welded-in inlets and corner joints are not acceptable). The two inner cones shall be constructed as a single, removable inner cone assembly for easy installation and cleaning. The inner cone assembly must have a hole with removable plug in the center to allow quick adjustment of an optional inlet damper without removing the inner cone assembly. Diffusers shall be constructed of 24 gauge steel (TMS) or .040 aluminum (TMS-AA). The finish shall be #26 white. The finish shall be an anodic acrylic paint, baked at 315° F for 30 minutes.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### DIFFUSERS, REGISTERS AND GRILLES

### 3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connection to ducts.

### 3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.
- B. Adjustable outlet diffuser: adjust pattern for draft-free air distribution.

### 3.4 CLEANING

- A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION 15855





## SECTION 15900 - HVAC INSTRUMENTATION AND CONTROLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail.
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.
- B. Related Sections include the following:
  - 1. Division 15 Section "Sequence of Operation" for requirements that relate to this Section.

#### 1.3 SYSTEM DESCRIPTION

- A. Furnish and install a complete control system consisting of a programmable room thermostat for heating and cooling control throughout the occupied facility spaces. The system shall be complete in all respects including labor, materials, equipment, and services necessary, and shall be installed by personnel regularly employed by the manufacturer.

#### 1.4 SUBMITTALS

- A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
  - 1. Each control device labeled with setting or adjustable range of control.
- B. Shop Drawings:
  - 1. Schematic flow diagrams showing fans, coils, dampers, valves, and control devices.
  - 2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
  - 3. Written description of sequence of operation.

4. Listing of connected data points, including connected control unit and input device.
  5. System configuration showing peripheral devices, batteries, power supplies, diagrams, and interconnections.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- D. Maintenance Data: For systems to include in maintenance manuals specified in Division 1. Include the following:
1. Maintenance instructions and lists of spare parts for each type of control device.
  2. Interconnection wiring diagrams with identified and numbered system components and devices.
  3. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
  4. Calibration records and list of set points.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

#### 1.7 COORDINATION

- A. Coordinate location of thermostats and other exposed control sensors with plans and room details before installation.
- B. Sheet Metal Subcontractor:
1. Setting of automatic control dampers, and necessary blank off plates.
  2. Access doors where and as required.
- C. Electrical Subcontractor:
1. All power wiring as specified in Division 16.
- D. Complying with the principle of "unit responsibility" all electrical work for automatic controls, except as otherwise specified, or shown on the electrical drawings shall be included in Division

15. Electrical work shall, in general, comply with the following, unless otherwise directed by Division 16:

1. All electrical work shall comply with the N.E.C. and local electrical codes.
2. All low voltage wiring in finished rooms shall be concealed below working heights and exposed above.
3. Electrical work may include both line voltage and low voltage wiring, as required.
4. Conduit network for power systems may be used for running control high voltage wiring.
5. All safety devices shall be wired through both "hand" and "auto" positions of motor starting device to insure 100% safety shut-off.
6. The motor starter supplier shall provide auxiliary contacts as required for interlock by temperature control contractor; the supplier shall estimate an allowance of at least one auxiliary contract per starter. All interlock and control wiring shown on the electrical plans is by the electrical subcontractor.
7. Low voltage plenum rated wiring can be run exposed above working heights and above accessible ceiling. Wiring shall be neatly tied to pipes, EMT or other devices and not laid on ceiling tile.
8. Run wiring in EMT where exposed in all mechanical rooms.

E. Coordinate supply of conditioned electrical circuits for control units and operator workstation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Electric, and Electronic Systems:
  - a. Honeywell, Inc.; Home & Building Control.
  - b. Johnson Controls, Inc.; Controls Group.
  - c. Invensys Controls.
  - d. Siemens Building Technology – Landis Division.
  - e. Delta Controls.

### 2.2 THERMOSTATS

A. Electric solid-state, microcomputer-based room thermostat.

1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from set point.
3. Set up for two separate temperatures per day.
4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
5. Short-cycle protection.
6. Programming based on every day of week.
7. Selection features include deg F or deg C display, 12- or 24-hour clock, keyboard disable, fan on-auto.

8. Thermostat shall be equal to Honeywell T7300 series, with Q7300 subbase; and include five T7047G series remote sensors, or approved equal, to provide a temperature averaging network for all conditioned spaces.
9. Battery replacement without program loss.
10. Thermostat display features include the following:
  - a. Time of day.
  - b. Actual room temperature.
  - c. Programmed temperature.
  - d. Programmed time.
  - e. Duration of timed override.
  - f. Day of week.
  - g. System mode indications include "heating," "cooling," "auto," "off," "fan auto," and "fan on."

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that conditioned power supply is available to control units and operator workstation.

#### 3.2 INSTALLATION

- A. Install equipment level and plumb.
- B. Implement all features of programs to specified requirements and as appropriate to sequence of operation.
- C. Connect and configure equipment to achieve sequence of operation specified.
- D. Verify location of thermostats and other exposed control sensors with plans and room details before installation. Locate all space sensors and thermostats 48 inches above the floor, as required for ADA.

#### 3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install building wire and cable according to Division 16.
  1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
  2. Install exposed cable in raceway.
  3. Install concealed cable in raceway.
  4. Bundle and harness multi-conductor instrument cable in place of single cables where several cables follow a common path.

5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
  6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
- B. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- C. Connect "hand-off-auto" selector switches to override automatic interlock controls when switch is in "hand" position.

END OF SECTION 15900



## SECTION 15940 - SEQUENCE OF OPERATIONS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 15 Section "Basic Mechanical Materials and Methods" for general motor requirements.
  - 2. Division 15 Section "HVAC Instrumentation and Controls"

#### 1.2 SUMMARY

- A. This Section includes control sequences for HVAC systems, subsystems, and equipment. Provide control devices, control software and control wiring as required for automatic operation of each sequence specified.
- B. Provide automatic control for system operation as described herein, although word "automatic" or "automatically", is not used.
- C. Manual operation is limited only where specifically described; however, provide manual override for each automatic operation.
- D. Where manual start-up is called for, also provide scheduled automatic start-stop capabilities.
- E. For each item of equipment, provide following functions which are not specifically mentioned in each Sequence of Operation:
  - 1. Start-Stop, manual, and scheduled
  - 2. On-Off status of each piece of equipment
  - 3. Run-time
- F. Coordination of Air-Handling Unit Sequences: Ensure that preheat, mixed-air, heating-coil, and cooling-coil controls have common inputs and do not overlap in function. Provide a deadband between heating and cooling stages.
- G. Normal positions for controlled devices:
  - 1. Unless noted, the following dampers shall fail closed:
    - a. Outside air dampers

#### SEQUENCE OF OPERATIONS



### 1.3 DEFINITIONS

- A. DDC: Direct-digital controls.
- B. BAS: Building Automation System
- C. ADJ.: Adjustable
- D. OA: Outside Air
- E. RA: Return Air
- F. RLA: Relief Air
- G. DA: Discharge Air
- H. EA: Exhaust Air
- I. MA: Mixed Air
- J. MOD: Motor operated damper

### 1.4 AIR SYSTEM – TYPICAL SEQUENCE

#### A. Occupied mode:

1. Occupied mode shall be determined by:
  - a. User defined occupancy schedule.
  - b. Local space thermostat with override button that will index the unit to the Occupied mode for up to 3 hours.
2. With the H-O-A starter in the automatic position, system starts supply fan to run continuously.
3. DX cooling shall function as described for the specific modes of operation
4. Heating furnace shall be under control.
5. MOD at fresh air intake shall be open.

#### B. Unoccupied mode:

1. OA damper 100% closed.
2. Gas furnace and unit supply fan cycle to maintain heating set back space temperature.
3. Mechanical cooling shall be disabled.
4. System shall have 3 hour (adj) unoccupied override ability.

### SEQUENCE OF OPERATIONS

C. Safeties:

1. Shall stop the supply fan, cause the system valves and dampers to return to their normal positions.
2. DA high temperature limit is 105 F (adj) and low temperature limit is 50 F (adj).

1.5 Heating and Cooling

- A. LP gas Furnace: During occupied periods, when fan is running, the LP gas furnace cycles to maintain space heating setpoint. Furnace operation shall be controlled through factory mounted controls and safeties.
- B. DX Cooling Coil: During occupied periods, when fan is running, system stages the DX system to maintain space cooling setpoint. Factory mounted controls shall cycle the condensing unit and control operation of the expansion valve.
1. During unoccupied periods, cooling shall be off.
  2. When the outside air temperature is 0F or cooler, the mechanical cooling shall be disabled.

1.6 TERMINAL UNIT OPERATING SEQUENCE

- A. Unit Heaters:
1. Gas fired: On call for heat space thermostat starts supply fan and enables gas combustion through unit manufacturer's gas train safety controls. When space reaches setpoint the reverse happens.

1.7 EXHUAUST FANS

- A. Exhaust fan (EF-1) shall be interlocked with AC-1 occupied mode: Fan shall run continuously.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 15940

SEQUENCE OF OPERATIONS



## SECTION 15950 - TESTING, ADJUSTING, AND BALANCING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:
  - a. Constant-volume air systems.
2. HVAC equipment quantitative-performance settings.
3. Verifying that automatic control devices are functioning properly.
4. Reporting results of activities and procedures specified in this Section.

#### 1.3 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.
- C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.
- D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- E. NC: Noise criteria.
- F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- G. RC: Room criteria.
- H. Report Forms: Test data sheets for recording test data in logical order.

- I. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.
- J. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.
- K. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- L. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- M. TAB: Testing, adjusting, and balancing.
- N. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- O. Test: A procedure to determine quantitative performance of systems or equipment.
- P. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

#### 1.4 SUBMITTALS

- A. Qualification Data: Within 30 days from Contractor's Notice to Proceed, submit 2 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.
- C. Warranties specified in this Section.

#### 1.5 QUALITY ASSURANCE

- A. TAB Firm Qualifications: Perform all work in accordance with AABC or NEBB procedures.
- B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
  - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  - 2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems".
- D. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's

#### TESTING, ADJUSTING, AND BALANCING

"Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

- E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.
  - 1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

#### 1.6 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

#### 1.7 WARRANTY

- A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:
- B. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:
  - 1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
  - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine Project Record Documents described in Division 1.

- D. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
- E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
- F. Examine system and equipment test reports.
- G. Examine HVAC system and equipment installations to verify that indicated balancing devices are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- I. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units to verify that they are accessible and their controls are connected and functioning.
- K. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.
- L. Examine strainers for clean screens and proper perforations.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine equipment for installation and for properly operating safety interlocks and controls.
- O. Examine automatic temperature system components to verify the following:
  - 1. Dampers, valves, and other controlled devices are operated by the intended controller.
  - 2. Dampers and valves are in the position indicated by the controller.
  - 3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions.
  - 4. Automatic modulating and shutoff valves are properly connected.
  - 5. Sensors are located to avoid adverse effects of sunlight, drafts, and cold walls.
  - 6. Sensors are located to sense only the intended conditions.
  - 7. Sequence of operation for control modes is according to the Contract Documents.
  - 8. Controller set points are set at indicated values.
  - 9. Interlocked systems are operating.
  - 10. Changeover from heating to cooling mode occurs according to indicated values.

- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### 3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
  - 1. Permanent electrical power wiring is complete.
  - 2. Automatic temperature-control systems are operational.
  - 3. Equipment and duct access doors are securely closed.
  - 4. Balance dampers are open.
  - 5. Isolating and balancing valves are open and control valves are operational.
  - 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
  - 7. Windows and doors can be closed so indicated conditions for system operations can be met.

### 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, and similar controls and devices, to show final settings.

### 3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.



- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling unit components.
- K. Check for proper sealing of air duct system.

### 3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure fan static pressures to determine actual static pressure as follows:
    - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet or through the flexible connection.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
  - 2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
  - 3. Measure static pressures entering and leaving other devices under final balanced conditions.
  - 4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
  - 5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
  - 6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, sub-main ducts, and major branch ducts to indicated airflows within specified tolerances. Measure static pressure at a point downstream from the

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balancing damper and adjust volume dampers until the proper static pressure is achieved. Where sufficient space in sub-main and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone. Re-measure each sub-main and branch duct after all have been adjusted. Continue to adjust sub-main and branch ducts to indicated airflows within specified tolerances.

- C. Measure terminal outlets and inlets without making adjustments. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values.
- E. Adjust patterns of adjustable outlets for proper distribution without drafts.

### 3.6 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
  - 1. Manufacturer, model, and serial numbers.
  - 2. Motor horsepower rating.
  - 3. Motor rpm.
  - 4. Efficiency rating.
  - 5. Nameplate and measured voltage, each phase.
  - 6. Nameplate and measured amperage, each phase.
  - 7. Starter thermal-protection-element rating.

### 3.7 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

### 3.8 PROCEDURES FOR TEMPERATURE MEASUREMENTS

- A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

### 3.9 TEMPERATURE-CONTROL VERIFICATION

- A. Assist the BAS Contractor as follows:
  - 1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.

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2. The contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours.
  3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
  4. The tools used during the test and balance process shall be returned at the completion of the testing and balancing.
- B. Verify that controllers are calibrated and commissioned.
- C. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- D. Record controller settings and note variances between set points and actual measurements.
- E. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).
- F. Check free travel and proper operation of control devices such as damper and valve operators.
- G. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.
- H. Check the interaction of electrically operated switch transducers.
- I. Check the interaction of interlock and lockout systems.
- J. Check main control supply-air pressure and observe compressor and dryer operations.
- K. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or non-grounded power supply.
- L. Note operation of electric actuators using spring return for proper fail-safe operations.

### 3.10 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: 0 to plus 10 percent.
  2. Air Outlets and Inlets: Minus 10 to plus 10 percent.

### 3.11 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems

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found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

### 3.12 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
  - 1. Include a list of instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to certified field report data, include the following:
  - 1. Fan curves.
  - 2. Manufacturers' test data.
  - 3. Field test reports prepared by system and equipment installers.
  - 4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.
- D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
  - 1. Title page.
  - 2. Name and address of TAB firm.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.
  - 6. Engineer's name and address.
  - 7. Contractor's name and address.
  - 8. Report date.
  - 9. Signature of TAB firm who certifies the report.
  - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  - 11. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  - 12. Nomenclature sheets for each item of equipment.
  - 13. Data for terminal units, including manufacturer, type size, and fittings.
  - 14. Notes to explain why certain final data in the body of reports varies from indicated values.
  - 15. Test conditions for fans and pump performance forms including the following:
    - a. Settings for outside-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Cooling coil, wet- and dry-bulb conditions.

#### TESTING, ADJUSTING, AND BALANCING

- d. Face and bypass damper settings at coils.
  - e. Fan drive settings including settings and percentage of maximum pitch diameter.
  - f. Inlet vane settings for variable-air-volume systems.
  - g. Settings for supply-air, static-pressure controller.
  - h. Other system operating conditions that affect performance.
- E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
- 1. Quantities of outside, supply, return, and exhaust airflows.
  - 2. Water and steam flow rates.
  - 3. Duct, outlet, and inlet sizes.
  - 4. Pipe and valve sizes and locations.
  - 5. Terminal units.
  - 6. Balancing stations.
  - 7. Position of balancing devices.
- F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
- 1. Unit Data: Include the following:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Manufacturer's serial number.
    - f. Unit arrangement and class.
    - g. Discharge arrangement.
    - h. Sheave make, size in inches (mm), and bore.
    - i. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
    - j. Number of belts, make, and size.
    - k. Number of filters, type, and size.
  - 2. Motor Data:
    - a. Make and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches (mm), and bore.
    - f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
  - 3. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm (L/s).
    - b. Total system static pressure in inches wg (Pa).
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg (Pa).
    - e. Filter static-pressure differential in inches wg (Pa).
    - f. Preheat coil static-pressure differential in inches wg (Pa).

- g. Cooling coil static-pressure differential in inches wg (Pa).
- h. Heating coil static-pressure differential in inches wg (Pa).
- i. Outside airflow in cfm (L/s).
- j. Return airflow in cfm (L/s).
- k. Outside-air damper position.
- l. Return-air damper position.
- m. Vortex damper position.

G. Gas-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and unit size.
- e. Manufacturer's serial number.
- f. Fuel type in input data.
- g. Output capacity in Btuh (kW).
- h. Ignition type.
- i. Burner-control types.
- j. Motor horsepower and rpm.
- k. Motor volts, phase, and hertz.
- l. Motor full-load amperage and service factor.
- m. Sheave make, size in inches (mm), and bore.
- n. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).

2. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm (L/s).
- b. Entering-air temperature in deg F (deg C).
- c. Leaving-air temperature in deg F (deg C).
- d. Air temperature differential in deg F (deg C).
- e. Entering-air static pressure in inches wg (Pa).
- f. Leaving-air static pressure in inches wg (Pa).
- g. Air static-pressure differential in inches wg (Pa).
- h. Low-fire fuel input in Btuh (kW).
- i. High-fire fuel input in Btuh (kW).
- j. Manifold pressure in psig (kPa).
- k. High-temperature-limit setting in deg F (deg C).
- l. Operating set point in Btuh (kW).
- m. Motor voltage at each connection.
- n. Motor amperage for each phase.
- o. Heating value of fuel in Btuh (kW).

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

- a. System identification.
  - b. Location.
  - c. Make and type.
  - d. Model number and size.
  - e. Manufacturer's serial number.
  - f. Arrangement and class.
  - g. Sheave make, size in inches (mm), and bore.
  - h. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
2. Motor Data:
  - a. Make and frame type and size.
  - b. Horsepower and rpm.
  - c. Volts, phase, and hertz.
  - d. Full-load amperage and service factor.
  - e. Sheave make, size in inches (mm), and bore.
  - f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
  - g. Number of belts, make, and size.
3. Test Data (Indicated and Actual Values):
  - a. Total airflow rate in cfm (L/s).
  - b. Total system static pressure in inches wg (Pa).
  - c. Fan rpm.
  - d. Discharge static pressure in inches wg (Pa).
  - e. Suction static pressure in inches wg (Pa).
- I. Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
  1. Report Data:
    - a. System and air-handling unit number.
    - b. Location and zone.
    - c. Traverse air temperature in deg F (deg C).
    - d. Duct static pressure in inches wg (Pa).
    - e. Duct size in inches (mm).
    - f. Duct area in sq. ft. (sq. m).
    - g. Indicated airflow rate in cfm (L/s).
    - h. Indicated velocity in fpm (m/s).
    - i. Actual airflow rate in cfm (L/s).
    - j. Actual average velocity in fpm (m/s).
    - k. Barometric pressure in psig (Pa).
- J. Compressor and Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, or water-cooled condensing units, include the following:
  1. Unit Data:

- a. Unit identification.
  - b. Location.
  - c. Unit make and model number.
  - d. Compressor make.
  - e. Compressor model and serial numbers.
  - f. Refrigerant weight in lb (kg).
  - g. Low ambient temperature cutoff in deg F (deg C).
2. Test Data (Indicated and Actual Values):
- a. Inlet-duct static pressure in inches wg (Pa).
  - b. Outlet-duct static pressure in inches wg (Pa).
  - c. Entering-air, dry-bulb temperature in deg F (deg C).
  - d. Leaving-air, dry-bulb temperature in deg F (deg C).
  - e. Condenser entering-water temperature in deg F (deg C).
  - f. Condenser leaving-water temperature in deg F (deg C).
  - g. Condenser-water temperature differential in deg F (deg C).
  - h. Condenser entering-water pressure in feet of head or psig (kPa).
  - i. Condenser leaving-water pressure in feet of head or psig (kPa).
  - j. Condenser-water pressure differential in feet of head or psig (kPa).
  - k. Control settings.
  - l. Unloader set points.
  - m. Low-pressure-cutout set point in psig (kPa).
  - n. High-pressure-cutout set point in psig (kPa).
  - o. Suction pressure in psig (kPa).
  - p. Suction temperature in deg F (deg C).
  - q. Condenser refrigerant pressure in psig (kPa).
  - r. Condenser refrigerant temperature in deg F (deg C).
  - s. Oil pressure in psig (kPa).
  - t. Oil temperature in deg F (deg C).
  - u. Voltage at each connection.
  - v. Amperage for each phase.
  - w. Kilowatt input.
  - x. Crankcase heater kilowatt.
  - y. Number of fans.
  - z. Condenser fan rpm.
  - aa. Condenser fan airflow rate in cfm (L/s).
  - bb. Condenser fan motor make, frame size, rpm, and horsepower.
  - cc. Condenser fan motor voltage at each connection.
  - dd. Condenser fan motor amperage for each phase.

K. Instrument Calibration Reports:

1. Report Data:
- a. Instrument type and make.
  - b. Serial number.
  - c. Application.
  - d. Dates of use.
  - e. Dates of calibration.



### 3.13 INSPECTIONS

#### A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:
  - a. Measure airflow of at least 10 percent of air outlets.
  - b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
  - c. Measure sound levels at two locations.
  - d. Measure space pressure of at least 10 percent of locations.
  - e. Verify that balancing devices are marked with final balance position.
  - f. Note deviations to the Contract Documents in the Final Report.

END OF SECTION 15950

## SECTION 16000 - BASIC ELECTRICAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. Alternates: Refer to Division 1 to determine extent of, if any, work of this section that will be affected by any alternates if accepted.
  - 1. The work of this section includes disconnecting and removing electrical and telephone service entrances to existing building under Alternate #1.
- B. Furnish all materials, equipment, labor, and supplies and perform all operations necessary to complete the electrical work in accordance with the intent of the drawings and these specifications.
- C. Temporary Power and Lighting: Provide separate meter and service for construction area .
  - 1. Power Distribution: Provide weatherproof, grounded circuits with ground-fault interruption features, with proper power characteristics and either permanently wired or plug-in connections as appropriate for intended use. Provide overload-protected disconnect switch for each circuit at distribution panel. Space 4-gang convenience outlets (20 amp circuit) so that every portion of work can be reached with 100' extension cord.
  - 2. Temporary Lighting: Provide lighting of intensity and quality sufficient for proper and safe performance of the work and for access thereto and security thereof. (Consult OSHA requirements.)
- D. Provide empty conduit system for signal wiring and all power wiring and grounding for scale, scale controls, traffic control signals, and remote displays as indicated on the drawings and as recommended by the scale manufacturer.

#### 1.3 QUALITY ASSURANCE

- A. All wiring shall be in accordance with the latest issue of the National Electrical Code.

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- B. The service equipment shall be grounded at the service entrance switch enclosure. This shall also be the grounding point for the service conduit, boxes, fittings and metal enclosed equipment used in the building wiring system. Any grounding methods allowed under Article 250 of the National Electrical Code may be used provided the ground resistance is less than 25 ohms. This resistance shall be tested.
- C. Ground Resistance Testing:
  - 1. Measure ground resistance with bridge type meter designed for testing grounds.
  - 2. Record readings, conditions of soil, model of meter, date, and name of tester.
  - 3. Conduct test in presence of Owner or his Representative. The test shall be made no less than 48 hours after a rain.
- D. The Contractor shall show evidence, upon request, of having successfully completed at least five similar projects. Installation of each system shall be under the supervision of a factory-authorized organization.
- E. The Contractor shall show evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The Contractor must have a service contract program for the maintenance of the system after the guarantee period.
- F. All electrical equipment shall be approved by Underwriters Laboratories, Inc. Each system shall be products of a single manufacturer of established reputation and experience. The Contractor shall have supplied similar apparatus to comparable installations rendering satisfactory service for at least three years.
- G. For each system, the manufacturer shall furnish "gratis" to the Owner a one-year contract effective from the date of installation for maintenance and inspection services of the manufacturer's equipment with a minimum of two inspections during the contract year.

#### 1.4 SYSTEM DESCRIPTION

- A. The utility providing service is Central Maine Power Co. The facility is primary metered. The existing site lighting is supplied by a 480V single-phase service via a transclosure that is owned by the Owner. The existing building is supplied by a 240/120V, single-phase service via a padmount transformer that is owned by the Owner.
- B. Provide a 120/240-volt, 1-phase, 3-wire secondary service to the new building from the secondary terminals on the existing padmount transformer.
- C. Prior to submission for review of any item of equipment, determine whether or not it will fit in the space provided. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Architect/Engineer and approval received before such alterations are made.

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## 1.5 SUBMITTALS

### A. In accordance with Division 1, furnish the following:

1. Manufacturer's descriptive literature: For each type of product indicated.
2. Submit shop drawings that include engineering drawings of the system with specification sheets covering all component parts of the system and interconnection diagrams.
3. Certification:
  - a. Prior to final inspection, deliver to the Owner's Representative four (4) copies of certification that the material is in accordance with the drawings and specifications and has been properly installed.
  - b. Submit certification of system operating test.
4. Manuals: Submit copies of complete set of operating instructions including circuit diagrams and other information of system components. Supply six complete sets of each.

## 1.6 PROJECT CONDITIONS

### A. Regulatory Requirements:

1. Conform to the requirements of all laws and regulations applicable to the work.
2. Cooperate with all authorities having jurisdiction.
3. Compliance with laws and regulations governing the work on this project does not relieve the Contractor from compliance with more restrictive requirements contained in these specifications.
4. If the Contract Documents are found to be at variance with any law or regulation, the Contractor shall notify the Architect/Engineer promptly in writing. The Contractor shall assume full responsibility for any work contrary to law or regulation, and shall bear all costs for the corrections thereof.
5. Minimum Requirements: The National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), the National Fire Codes, and National Fire Protection Association (NFPA) are a minimum requirement for work under this section. Design drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the NEC.

### B. Permits, Fees, and Inspections:

1. Secure and pay for all permits, fees, licenses, inspections, etc., required for the work under Division 16.

2. Schedule and pay for all legally required inspections and cooperate with inspecting officers.
3. Provide Certificates of Inspection and Approval from all regulatory authorities having jurisdiction over the work in Division 16.

C. Drawings:

1. Do not scale the drawings. The general location of the apparatus and the details of the work are shown on the drawings, which form a part of this specification. Exact locations are to be determined at the building as the work progresses, and shall be subject to the Architect/Engineer's approval. Actual field conditions shall govern all dimensions.
2. Anything shown on the drawings and not mentioned in the specifications or vice versa shall be furnished as if it were both shown and specified.
3. It is not intended that the drawings shall show every wire, device, fitting, conduit or appliance, but it shall be a requirement to furnish without additional expense, all material and labor necessary to complete the systems in accordance with the NEC and the best practice of the trade.

1.7 WARRANTY

- A. The Contractor shall guarantee all equipment and wiring free from inherent mechanical or electrical defects for one year from date of acceptance.

1.8 RELATED WORK

- A. Division 2 – Site Construction
- B. Division 15 – Mechanical

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Toggle Switches: 20A, 120/277V, 1-pole, ivory specification grade, mount 4'-0" above finished floor at door entrance.
- B. Switch-box Occupancy Sensors:
  1. Available Manufacturers:
    - a. Bryant Electric; a Hubbell Company.
    - b. Hubbell Lighting Inc.
    - c. Leviton Mfg. Company Inc.

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- d. Lightolier Controls; a Genlyte Company.
  - e. Lithonia Lighting.
  - f. Watt Stopper (The).
2. Description: Dual technology passive infrared/ultrasonic type with integral power-switching contacts rated for 800 W at 120-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; and rated for 1000 W at 120-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/3-hp motors, minimum.
- a. Include ground wire.
  - b. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keeps lighting off when selected lighting level is present. This function shall be field selectable as enabled or disabled.
  - c. Capable of turning lights on and off automatically, or operating in manual-on/automatic-off mode. Mode shall be field selectable.
- C. Indoor Occupancy Sensors:
1. Available Manufacturers:
- a. Hubbell Lighting Inc.
  - b. Leviton Mfg. Company Inc.
  - c. Lithonia Lighting.
  - d. Watt Stopper (The).
2. General Description: ceiling-mounting, solid-state units with a separate relay unit.
- a. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  - b. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
  - c. Relay Unit: Dry contacts rated for 20-A ballast load at 120V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
  - d. Mounting:
    - 1) Sensor: Suitable for mounting in any position on a standard outlet box.
    - 2) Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    - 3) Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
  - e. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
  - f. Bypass Switch: Override the on function in case of sensor failure.

- g. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keeps lighting off when selected lighting level is present. This function shall be field selectable as enabled or disabled.
3. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.
    - a. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in..
    - b. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
    - c. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.
  4. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.
    - a. Detector Sensitivity: Detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
    - b. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
    - c. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on an 8-foot- high ceiling.
    - d. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.
  5. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.
    - a. Sensitivity Adjustment: Separate for each sensing technology.
    - b. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
    - c. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
- D. Digital Time switches shall be Wattstopper, model TS-200-I or approved equal.
  - E. Receptacles shall be ivory specification grade, mounted 18" above finished floor unless otherwise noted.
  - F. Duplex Receptacles With Ground-Fault Interrupter shall be an integral unit suitable for mounting in a standard outlet box.

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1. Ground-Fault Interrupter shall consist of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. It shall be rated for operation on a 60 Hz, 120-volt, 20-ampere branch circuit. Device shall have nominal sensitivity to ground leakage current of five milliamperes and shall function to interrupt the current supply for any value of ground leakage current above five milliamperes on the load side of the device. Device shall have a minimum nominal tripping time of 1/30th of a second.
  2. Receptacle shall be rated 20 amperes, 125 volts for indoor use and shall be the standard duplex, three-wire, grounding type.
- G. Weatherproof Receptacles shall consist of a duplex GFI receptacle, as specified, mounted in a weatherproof box with a gasketed, weatherproof, cast metal cover plate and cap over each receptacle opening. The cap shall be permanently attached to the cover plate by a spring hinged flap. The weatherproof integrity shall not be affected when heavy duty specification or hospital grade attachment plug caps are inserted. Cover plates on outlet boxes mounted flush in the wall shall be gasketed to the wall in a watertight manner.
- H. Plates shall be 302 stainless steel.
- I. Boxes shall be steel minimum 2-1/2" deep.
- J. In-ground junction boxes and handholes: Quazite PG style or approved equal.
1. Provide "electric" logo on cover.
  2. boxes and covers shall be UL listed.
  3. Minimum size of site lighting handholes shall be 11"x18".
  4. Minimum size of handholes for 4" conduits shall be 17"x30" where conduits stub vertically into bottom of handhole.
  5. In-ground junction boxes and handholes shall have tier 15 load rating for enclosure and cover.
- K. Light Fixtures: The light fixtures shall be as described on the drawings or other approved equal is also acceptable.
- L. Disconnect Switches shall be heavy-duty type, horsepower rated.
- M. Motor Starters:
1. Magnetic motor starters shall be combination circuit breaker or fused disconnect switch type, mounted in a common enclosure. Starters shall be three-pole with three melting alloy overload relays. Overload heaters shall be coordinated with Division 15. Thermal units shall be of one-piece construction and interchangeable. Starter shall be inoperative with any thermal unit removed. The disconnect operating handle shall be position indicating.
    - a. Provide a control device and pilot light on the cover of each combination starter. Control devices for motors with remote manual or automatic control shall be "hand-off-auto" switches. Control devices for locally controlled motors shall be "start-stop" pushbuttons.

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- b. 120-volt magnetic motor starters may consist of a circuit breaker or fused disconnect switch and a magnetic starter in separate enclosures mounted next to each other.
  - c. Control circuits shall operate at a maximum of 120 volts. Provide control transformers as required.
- 2. Starters shall be mounted within NEMA-1 enclosures unless specified otherwise.
  - 3. All starters shall be lockable in the "off" position.
  - 4. Overload heaters shall be sized for the motor nameplate full-load amperes per the manufacturer's recommendations.

N. Wiring Materials:

- 1. Wiring shall be enclosed in electrical rigid galvanized steel, intermediate metal conduit, or electrical metallic tubing sized in accordance with code requirements for the conductors. Types MC or NM cable may be used where concealed in walls or ceilings and allowed by code.
  - a. Conduit fittings shall be steel.
  - b. Terminations for all conduit shall have insulated bushings or insulated throat connectors in accordance with code requirements.
  - c. All conduits shall be substantially supported with approved clips or hangers spaced not to exceed ten feet on center. Minimum conduit size shall be 1/2".
- 2. Flexible Metal Conduit shall be used for all connections to motors and vibrating equipment and shall comply with Fed. Spec. WW-C-566.
- 3. Liquid-Tight Flexible Metal Conduit shall consist of flexible steel conduit with a liquid-tight PVC jacket over the conduit.
  - a. Fittings shall incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening.
  - b. Liquid-tight flexible metal conduit shall be used in damp or wet locations when flexible metal conduit would otherwise be used.
  - c. Liquid-tight flexible metal conduit shall not penetrate the roof or exterior walls, and shall not be installed in lengths exceeding 72" except where necessary for flexibility.
- 4. Nonmetallic Conduit: Fed. Spec. W-C-1094, Type II or Type III shall apply. Conduit shall be Schedule 40 heavy wall PVC or high density PE. Conduit shall be UL listed for use above ground and direct burial underground and be sunlight resistant.

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5. All Wiring shall be type THW, XHHW, or THWN, UL labeled, copper conductors with 600-volt insulation, except as otherwise noted. Minimum size wire shall be No. 12 AWG.
6. Nonmetallic-Sheathed Cable (Type NM) shall be two-or three-conductor with a ground conductor and an overall covering that is flame-retardant and moisture-resistant. Minimum wire size shall be No. 12 AWG.
7. Type MC Cable shall have minimum No. 12 AWG type THWN or XHHW insulated copper conductors with an internal bare or insulated copper ground wire.

O. Fire-Stop Material:

1. Fire-stopping material shall maintain its dimension and integrity while preventing the passage of flame, smoke, and gases under conditions of installation and use when exposed to the ASTM E 119 time-temperature curve for a time period equivalent to the rating of the assembly penetrated. Cotton waste shall not ignite when placed in contact with the non-fire side during the test. Fire-stopping material shall be noncombustible as defined by ASTM E 136; and in addition for insulation materials, melt point shall be a minimum of 1700°F for one-hour protection and 1850°F for two-hour protection.
2. Seals for floor, exterior wall, and roof shall also be watertight.

P. Panelboards:

1. Refer to panelboard schedules in Section 16900 for further information.
2. Provide standard manufacturer products. All components of panelboards shall be the product and assembly of the same manufacturer. All similar units of all panelboards shall be of the same manufacturer.
3. Panelboard shall be listed as suitable for use as service equipment.
4. All panels shall be dead front safety type.
5. All panelboards shall be completely factory assembled with molded case circuit breakers.
6. Panels shall have main breaker or main lugs, bus size, voltage, phase, top or bottom feed, and flush or surface mounting all as scheduled in Section 16900 and indicated on the drawings.
7. Panelboards shall have the following features:
  - a. Non-reduced size copper or aluminum bus bars and connection straps bolted together and rigidly supported on molded insulators. Bus bar taps shall be arranged for sequence phasing of branch circuit devices.
  - b. Full size neutral bar mounted on insulated supports.

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- c. Ground bar with sufficient terminals for all grounding wires. The ground bar shall be insulated and isolated where called for on the drawings.
- d. Buses braced for the available short-circuit current, but not less than 10,000 amperes symmetrical. All panelboards shall be fully rated. Series rated assemblies are not acceptable.
- e. All breakers arranged so that it will be possible to substitute a two-pole breaker for two single pole breakers when frame size is 100 amperes or less.
- f. Design interior so that protective devices can be replaced without removing adjacent units, main bus connectors and without drilling or tapping.
- g. Where designated, on panel schedule as "space", include all necessary bussing, device supports and connections. Provide blank cover for each space.
- h. Provide galvanized steel cabinets to house panelboards. Cabinets for panelboards may be factory primed and suitably treated with a corrosion-resisting paint finish meeting UL standard for outdoor applications.
- i. Back and sides shall be of one-piece formed steel. Cabinets for panelboards may be of formed sheet steel with end and side panels welded, riveted or bolted as required.
- j. Provide minimum of four interior mounted studs and necessary hardware for in and out adjustment of panel interior.
- k. Fabricate trim of sheet steel consisting of frame with door attached by concealed hinges. Provide flush or surface trim as shown on the drawings.
- l. Surface trim shall have the same width and height as the box.
- m. Provide doors with flush type latch and manufacturer's standard lock.
- n. In making switching devices accessible, doors shall not uncover any live parts.
- o. Provide concealed butt hinges welded to the doors and trims.
- p. Provide keyed alike system for all panelboards.
- q. Provide a directory card, metal holder, and transparent cover. Permanently mount holders on inside of doors.
- r. Circuit breakers in panelboards shall be bolt on type on phase bus bar or branch circuit bar. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips.

Q. Transient Voltage Surge Suppressors (TVSS):

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1. Provide factory installed integral TVSS in panels. Field installed units shall not be acceptable.
2. UL Listed, UL1449.
3. Noise: less than 45 dBA at 5 feet.
4. 3 phase, 4 wire plus ground.
5. Dedication Modes:
  - a. Line to ground (L-G)
  - b. Line to Line (L-L)
  - c. Neutral to Ground (N-G)
  - d. Line to Neutral (L-N)
6. Category C with 8 x 20 microsecond waveform.
7. Joule rating shall meet or exceed ANSI/IEEE C62.41.
8. 5 year warranty from shipping date against part failure.
9. Quality Assurance
  - a. The specified system shall be thoroughly factory tested before shipment. Testing of each system shall include, but shall not be limited to, quality control checks, "Hi-Pot" tests at two times rated voltage plus 1000 volts per UL requirements, IEEE C62.41 Category B surge tests, UL ground leakage test, and operational and calibration tests.
  - b. The product shall be life cycle tested following suggested wait times as defined by ANSI/IEEE C62.45 and shall be capable of surviving 1000 sequential Category B surges of 10,000 Amps without failure.
  - c. The TVSS shall be provided with computer-generated graphs or oscillograms demonstrating the TVSS clamping voltage and operability. This test shall follow procedures outlined in ANSI/IEEE C62.45 for the installation category and applicable protection modes of the TVSS.

R. Grounding Conductors:

1. Grounding conductors shall be soft-drawn bare copper.
2. Insulated grounding wires shall be UL and NEC approved types, copper, with THWN or XHHW insulation color identified green, except where otherwise shown on the drawings or specified.

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3. Wire shall not be less than shown on the drawings and not less than required by the NEC.

S. Ground Rods:

1. Ground rods shall be copperweld steel, 5/8" diameter by ten feet long. Each rod shall be die-stamped near the top with the name or trademark of the manufacturer and the length of the rod.
2. Ground rods shall have hard, clean, smooth, continuous copper jacket surface throughout the length of the rod.

T. Ground Clamps:

1. Ground clamps shall be cast bronze or cast copper and shall be UL listed for grounding connections.
2. Ground clamps shall be sized for the specific conductor and electrode to be clamped.

U. Grounding Connections: Connections shall be of the exothermic type welding process as manufacturer by Caldweld or approved equal.

V. Equipment Grounding Connections: Connections shall be of the compression type solderless connectors.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. General:

1. All work shall be in accordance with the National Electrical Code's requirements as amended to date, with the local electric utility company's rules, the Fire Underwriter's requirements, and all local, state and federal laws and regulations.
2. In general, all wiring in finished areas shall be concealed in walls or above ceilings. Exposed wiring shall not be installed in finished areas without prior written authorization from the Engineer.
3. Conduits shall be of sizes required by the National Electrical Code. Exposed conduits shall be installed with runs parallel or perpendicular to walls and ceiling, with right-angle turns consisting of bends, fittings, or outlet boxes. No wire shall be installed until work that might cause damage to wires or conduits has been completed. Conduits shall be thoroughly cleaned of water or other foreign matter before wire is installed.
4. Where conduits, wireways and other electrical raceways pass through fire partitions, fire walls, or floor, install a fire-stop that provides an effective barrier against the spread of fire, smoke and gases. Fire-stop material shall be packed tight and completely fill

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clearances between raceways and openings. Floor, exterior wall, and roof seals shall also be made watertight.

5. Where raceways puncture roof, coordinate with Division 7.
6. All splices shall be mechanically and electrically perfect, using crimp type wire connectors.
7. Provide all disconnect switches required by the N.E.C.
8. Locate motor starters as shown on drawings.
9. Mount disconnect switches and starters at a height of 60" above finished floor unless otherwise noted.
10. Provide all necessary hardware for mounting motor starters.
11. Locate panelboards so that the present and future conduits can be conveniently connected.
12. A typewritten schedule of circuits, approved by the Owner's Representative shall be on the panel directory cards. Type the room numbers and items served on the cards. Three-complete separate copies of all directories, neatly bound, shall be delivered to the Owner's Representative.
13. Mount the panelboard so that maximum height of circuit breakers above finished floor shall not exceed 78".
14. Circuit numbers indicated on the drawings are the actual numbers assigned to the circuit in the panelboard and shall not be varied without the consent of the Architect/Engineer.
15. Provide all necessary hardware for mounting panelboards.
16. Branch circuit wiring may be nonmetallic-sheathed cable where concealed and allowed by Code, Type NM. NOTE: All romex shall be Properly Supported. (Provide continuous ground wire.)
17. Underground wiring may be installed in rigid nonmetallic conduit. In locations where nonmetallic conduits are used, change to heavy wall metallic conduit of the same internal diameter before rising out of ground. Provide metallic conduit elbows.
18. Feeder circuit wiring shall be in conduit or EMT.
19. All wiring in masonry walls shall be in conduit or EMT.
20. In general, conductors shall be the same size from the last protective device to the load and shall have an ampacity the same as or greater than the ampacity of the protective device where the wire size is not shown on the drawings. Use the 60°C ampacity rating for wire sizes No. 14 through No. 1. For 120V circuits, home runs longer than 50 feet

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shall be minimum No. 10 AWG, longer than 100 feet shall be minimum No. 8 AWG, and longer than 180 feet shall be minimum No. 6 AWG.

B. Grounding:

1. The entire electrical system shall be permanently and effectively grounded in accordance with Code requirements.
2. Run a grounding electrode conductor between the service entrance switch ground bus and the metallic water pipe system on the street side of the water meter.
3. The top of the ground rods shall be a minimum of 6" below finished grade.
4. All perimeter electrical splices and connections and all connections to ground rods, building steel, reinforcing rods, etc., shall be exothermic weld connections, Coldweld or approved equal.
5. Connections to the water service shall be made with an approved ground clamp.
6. Connections to junction boxes, equipment frames, etc., shall be bolted.
7. Conduit Systems:
  - a. Ground all metallic conduit systems.
  - b. Conduit systems shall contain a grounding conductor sized per NEC Table 250-122 or as shown on the drawings. Increase conduit size where necessary to accommodate the grounding conductor.
8. Feeders and Branch Circuits: Install green grounding conductors with all feeders and branch circuits.
9. Bare copper ground conductors shall be painted with bitumastic paint where they enter and leave concrete structures.
10. Bare copper ground conductors shall be a minimum of 30" below finished grade.
11. Lighting Fixtures: Conduits shall not be used for grounding fixtures. Green equipment grounding conductor must be bonded to all fixtures.

C. Install secondary service as shown on the drawings, as directed, and in conformance with the utility's requirements.

D. Alterations:

1. The Contractor shall study all drawings and specifications, visit the site, and acquaint himself with the existing conditions and the requirements of the plans and specifications. No claim will be recognized for extra compensation due to the failure of the Contractor to familiarize himself with the conditions and extent of the proposed work.

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2. The Contractor shall execute all alterations, additions, removals, relocations or new work, etc., as indicated or required to provide a complete installation in accordance with the intent of the drawing and specifications.
  3. Reconnect existing circuits to remain. Remove existing equipment to be discontinued.
  4. Any existing work disturbed or damaged by the alterations or new work shall be repaired or replaced to the Engineer's satisfaction.
  5. Equipment relocated or removed and reinstalled shall be cleaned and repaired to a first-class condition before reinstallation.
- E. Continuity of Services: Arrange to execute work at such times and in such locations to provide uninterrupted service to the building or any of its sections. If necessary, temporary power shall be installed to provide for this condition. Authorization for interrupting service shall be obtained in writing from the Owner. Any interruption of normal supply shall be performed during an overtime period to be scheduled with the Owner. Cost for overtime work shall be included in the bid.
- F. Identification: Provide tags on each end of all pulled wires giving location of other end. Provide phenolic nameplates for all panelboards, motor starters, disconnect switches (except switches located at motors), and duct smoke detector remote test/alarm-indicating stations..
- G. Record Drawings: The Contractor shall keep on the job a set of prints showing any changes to the installation. These shall be given to the Engineer at the completion of the work.
- H. Testing and Adjusting:
1. The entire installation shall be free from short-circuits and improper grounds. Tests shall be made in the presence of the Engineer or his representatives.
  2. Each individual lighting circuit shall be tested at the panel; and in testing for insulation resistance to ground, the lighting equipment shall be connected for proper operation. In no case shall the insulation resistance be less than that required by the National Electrical Code. Failures shall be corrected in a manner satisfactory to the Architect/Engineer.
  3. Each system shall be completely tested and shall be adjusted for proper operation as required by the Engineer.

END OF SECTION 16000





## SECTION 16720 - INTRUSION DETECTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  - 2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes intrusion detection sensors, signal equipment, system controls, alarm displays, and alarm indicating devices.

#### 1.3 DEFINITIONS

- A. Hard-Wired System: Alarm, supervisory, and detection devices that are directly connected, through individual dedicated conductors, to central-control unit.
- B. Zone: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between the sensors and the communication link to central-control unit.
- C. LCD: Liquid-crystal display.
- D. LED: Light-emitting diode.
- E. PIR: Passive infrared.

#### 1.4 SYSTEM DESCRIPTION

- A. Microprocessor-based central controls, remote intrusion sensors and detection devices, and a communication link to perform monitoring, alarm, and control functions. System is physically and electronically modular with provision for future expansion. System is self-monitoring and self-diagnostic.
  - 1. Communication Link: Hard wired, using separate individual circuits for each zone of alarm initiation, alarm device operation, and control.

## 1.5 SYSTEM FUNCTIONAL PERFORMANCE

- A. Central-Control Units: Continuously, electronically supervised system components for normal, alarm, and trouble conditions. Central-control unit indicates deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.
- B. System Control: Central-control unit directly monitors intrusion detection devices and circuits.
- C. Alarm Indication: Audible signal sounds and an LED lights at central-control unit identifying zone originating the alarm.
  - 1. Alarm activation sounds a siren.
  - 2. System shall include digital alarm communicator transmitter and associated programming wiring, etc. as required for central-station monitoring.
- D. Maximum Permissible Signal Time Elapse: Two seconds between actuation of any alarm or detection and its indication at central-control unit.
- E. Circuit Supervision: Central-control unit indicates circuit faults with both zone and trouble signals and makes a distinctive audible tone and illuminates an LED indicating light. Maximum permissible elapsed time between occurrence of a trouble condition and indication at central-control unit is 20 seconds.
- F. Manual Secure-Access Control: Coded entries at manual stations change status of associated zone between "secure" and "access."
  - 1. System shall be capable of controlling each zone individually. Each manual station shall be capable of changing the status of all zones, a single zone, or any combination of zones. Zones shall be defined as follows:
    - a. Garage
    - b. Lobby and Interview Room
    - c. Work Area

## 1.6 SUBMITTALS

- A. Product Data: Include components and testing agency listing data.
- B. Shop Drawings: Show plans, elevations, and sections detailing installed features and devices.
  - 1. System Wiring Diagrams: Include system diagram unique to Project. Show connections for all devices, components, and auxiliary equipment. Differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified.
- C. System Operation Description: Include method of operation and supervision of each component and each type of circuit, and sequence of operations for manually and automatically

### INTRUSION DETECTION

initiated system inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are not acceptable.

- D. Product Certificates: Signed by manufacturers of components certifying that products furnished comply with requirements.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- F. Record of field tests of system.
- G. Maintenance Data: For products and system to include in maintenance manuals specified in Division 1. Include data for each type of product, including all features and operating sequences, both automatic and manual. Include user's software data and recommendations for spare parts and components to be stocked at Project site.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A certified technician accredited by the National Burglar and Fire Alarm Association, and who is an authorized service representative of central-control unit manufacturer.
- B. Manufacturer Qualifications: Central-control unit manufacturer or factory-authorized agency maintains a service center capable of providing training, parts, and emergency maintenance and repairs for overall system at Project site with eight hours' maximum response time.
- C. Testing Agency Qualifications: Comply with requirements specified in Division 1. A current member firm of the National Burglar and Fire Alarm Association. Experienced in performing tests of intrusion detection systems.
  - 1. Testing Agency's Field Supervisor: Person currently certified as an advanced alarm technician by the National Burglar and Fire Alarm Association.
- D. Source Limitations: Obtain system components from central-control unit manufacturer who shall assume responsibility for system components and for their compatibility.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- F. Comply with NFPA 70.
- G. Comply with UL 609.

#### 1.8 SYSTEM SERVICE CONDITIONS

- A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
  - 1. Altitude: Sea level to 4000 feet.
  - 2. Ambient Temperature for Indoor Components: 0 to 40 deg C.

#### INTRUSION DETECTION

3. Relative Humidity for Indoor Components: 5 to 95 percent, noncondensing.

#### 1.9 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by manufacturer and Installer agreeing to replace intrusion detection devices and equipment that fail in materials or workmanship within specified warranty period.
- C. Warranty Period: One year from date of Substantial Completion.

#### 1.10 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Intrusion Detection Devices: Furnish quantity equal to 5 percent of the number of units of each type installed, but not less than one of each type.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Ademco.
  2. Edwards Signaling Products; a unit of General Signal.
  3. T-S-K Electronics, Inc.
  4. Westinghouse Security Electronics.

#### 2.2 EQUIPMENT

- A. Protection from Power Line Surges: Use integral surge suppressors listed in UL 1449 and complying with IEEE C62.41, Category B. Include the following features:
  1. Suppression Level: 300 V.
  2. Maximum Response Time: 5 nanoseconds.
  3. Circuit: Multistage, using inductors and silicon-avalanche zener diodes or equivalent.
  4. Indicator Lamp: Labeled neon or LED located on control unit and arranged to extinguish on failure of protection.
  5. Fuses: Externally accessible.

#### INTRUSION DETECTION

- B. System- and Equipment-Interference Resistance: Not affected by radiated-radio-frequency interference and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHZ and conducted interference signals up to 0.25-V RMS injected into power supply lines at 10 to 10,000 MHZ.
- C. Tamper Protection: Tamper switches on detection devices, control units, pull boxes, junction boxes, cabinets, and other system components indicated to provide an alarm signal when unit is opened or partially disassembled. Central-control unit identifies tamper alarms and indicates location in alarm display.

## 2.3 ELECTRICAL POWER

- A. Normal System Power Supply: 120 V, 60 Hz, through a locked disconnect device. System control unit supplies power to components.
- B. Power Continuity: Batteries in power supplies of control units and individual system components maintain continuous system operation during outage of normal ac system supply.
  - 1. Batteries: Rechargeable, valve-regulated, recombinant, sealed lead-acid type with nominal 10-year life expectancy. Capacity adequate to operate portion of system served, including audible trouble signal devices for up to four hours and audible and visual alarm devices under alarm conditions for an additional 10 minutes.
  - 2. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Charger recharges fully discharged battery within 24 hours.
- C. Annunciation: Central-control unit indicates, as a change in system condition, switching of system or component to backup power.

## 2.4 DOOR SWITCHES

- A. Description: Balanced-magnetic type complying with UL 634, door-mounting magnet part of magnetically operated switch installed in doorframe. Bias magnet and sensitive reed switch resists compromise by introducing foreign magnetic fields.
- B. Flush-Mounted Units: Unobtrusive, flush with surface of door frame and door.
- C. Overhead Door Switch: Balanced-magnetic type, listed for outdoor locations, and having door-mounting magnet and floor-mounting switch unit.

## 2.5 INTRUSION DETECTION DEVICES

- A. Comply with UL 639.
- B. Configuration: Single or multiple component to perform indicated functions.
- C. Power Source: One or more dedicated power supply circuits from control unit.
- D. Detection Indicator: LED in unit housing, latch type where indicated.

### INTRUSION DETECTION

1. Sensitivity: Detect presence of an intruder within their zone patterns, but not outside their zone patterns.
- E. PIR Devices: Detect intrusion by monitoring infrared wavelengths emitted by human body within their protected zone and not to general thermal variations.
1. Wall-Mounted Unit Maximum Detection Range: 125 percent of indicated zoned distance for individual units and not less than 50 feet.
  2. Ceiling-Mounted Unit Spot-Detection Pattern: Full 360-degree conical.
  3. Ceiling-Mounted Unit Pattern Size: 7-foot diameter at floor level for units mounted 8 feet above floor.

## 2.6 CONTROL UNITS

- A. Comply with UL 609.
- B. Cabinet: Lockable steel enclosure, arranged so operations required for testing, normal operation, and maintenance are performed from front of enclosure. If more than a single cabinet is required to form a complete control unit, provide exactly matching modular enclosures. Accommodate all components and allow ample gutter space for interconnecting cabinets and field wiring. Identify each enclosure by an engraved, laminated, phenolic-resin nameplate. Lettering on enclosure nameplate shall not be less than 1 inch high. Identify individual components and modules within cabinets with permanent labels.
- C. Systems: Separate and independent alarm and supervisory systems in control units. Alarm-initiating zone boards consist of plug-in cards. Arrangements requiring removal of field wiring for module replacement are not acceptable.
- D. Control Modules: Types and capacities as required to perform unit functions. Visible and audible signals in central-control unit indicate alarm, supervisory, and trouble conditions for each zone. Each type of audible alarm has a distinct sound.
- E. Zones: Quantity of alarm and supervisory zones as indicated with capacity for expanding number of zones by a minimum of 25 percent.
- F. Power Supply Circuits: Units provide power for remote power-consuming detection devices. Circuit capacity is adequate for at least a 25 percent increase in load.
- G. Indicating Lights: Individual LED devices designate each zone. An LED test switch for each control unit section illuminates all LED devices on that section of the unit. Manual toggle test-switches or push test-buttons do not require a key to operate. Alarm and supervisory signals light a red LED for the associated zone. Trouble signals light an amber LED for the associated zone.
- H. Resetting: Controls permit silencing audible signals for individual zones but prevent resetting of alarm, supervisory, or trouble signals while the condition still exists.
- I. Alphanumeric Display and System Controls: Arrange for basic interface between human operator at central-control unit and system components, including annunciation and supervision.

### INTRUSION DETECTION

A display with a minimum of 80 characters displays alarm, supervisory, and component status messages. Arrange keypad to enter and execute control commands.

## 2.7 SECURE-ACCESS CONTROL STATIONS

- A. Keypad and Display Module: Arranged for entering and executing commands for system-status changes and for displaying system-status and command-related data.

## 2.8 AUDIBLE AND VISUAL ALARM DEVICES

- A. Siren: 30-W speaker with siren driver, rated to produce a minimum sound output of 103 dB at 10 feet from central-control unit.
  - 1. Enclosure: Weather-resistant steel box with tamper switches on cover and on back of box.

## 2.9 CONDUCTORS AND CABLES

- A. Stranded Copper: Size conductors as recommended by system manufacturer, unless otherwise indicated.
- B. Comply with Section 16000 – Basic Electrical Requirements, unless otherwise indicated.
- C. Cable for Low-Voltage Control and Signal Circuits: Unshielded, twisted-pair cable, unless otherwise indicated or where manufacturer recommends shielded cable.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install system according to NFPA 70, applicable codes, and manufacturer's written instructions.
- B. Comply with UL 681.
- C. Wiring Method: Install wiring in raceways. Conceal raceways, except in unfinished indoor spaces and areas with exposed structural ceilings.
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Provide and use lacing bars and distribution spools.
- E. Number of Conductors: As recommended by system manufacturer for functions indicated.
- F. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- G. Connections: Comply with torque-tightening values specified in UL 486A.

## INTRUSION DETECTION



- H. Identify components, conductors, and cables according to Section 16000 – Basic Electrical Requirements. Color-code conductors, and apply wire and cable marking tape to designate wires and cables so media are identified and in coordination with system wiring diagrams.
- I. Install power supplies and other auxiliary components for detection devices at control units, unless otherwise indicated. Do not install such items near the devices they serve. Provide tamper switches where mounted separately from control units.

### 3.2 GROUNDING

- A. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

### 3.3 FIELD QUALITY CONTROL

- A. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
- B. Pretesting: Align and adjust system and perform pretesting of all components, wiring, and functions to verify compliance with specified requirements. Correct deficiencies by replacing malfunctioning or damaged items with new items.
- C. Manufacturer's Field Services: Engage a factory-authorized service representative to inspect field-assembled components and perform system pretesting, testing, adjustment, and programming.
  - 1. Operational Tests: Schedule tests after pretesting has been successfully completed. Perform operational system tests to verify compliance with Specifications. Test all modes of system operation and intrusion detection. Methodically test for detection of intrusion and for false alarms in each zone of intrusion detection. Test for false alarms by simulating activities outside indicated detection patterns.
  - 2. Report: Prepare a written report of observations, inspection, and tests.
- D. Retesting: Correct deficiencies and retest until total system meets requirements of the Specifications and complies with applicable standards.
- E. Schedule testing with at least seven days' advance notice.

### 3.4 ADJUSTING

- A. Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting and reprogramming to suit actual occupied conditions. Provide up to two visits to Project for this purpose without additional cost.

## INTRUSION DETECTION

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to explain programming and operation of system and to train Owner's maintenance personnel on procedures and schedules for maintaining, programming, operating, adjusting, troubleshooting, and servicing system. Provide a minimum of eight hours' training in operation and maintenance.
- B. Schedule training with Owner with at least seven days' advance notice.

END OF SECTION 16720



## SECTION 16740 - TELECOMMUNICATIONS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The more stringent of the following provisions shall prevail:
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
  2. State of Maine Department of Transportation, "Standard Specifications for Highways and Bridges," Revision 2002, apply to this Section.

#### 1.2 WORK INCLUDED

- A. Furnish all labor, materials, equipment, and supplies, and perform all operations necessary to provide the following for the telecommunications systems including but not limited to the data and telephone systems in accordance with the specification and drawings. Work includes but is not limited to the following:
1. Data, voice and all other telecommunication cabling, connections, termination hardware, and faceplates as specified, shown on the drawings and as needed to provide a complete system.
    - a. All data cabling will originate and terminate at the telecommunications backboard.
    - b. All voice cabling will originate and terminate at the telecommunications backboard.
  2. Cable supports and cable pathways to support all telecommunications cabling to be installed.
  3. Provide and install all conduit, outlet boxes, and device rings for all telecommunications outlet locations.
    - a. At a minimum provide a 1" EMT conduit from an accessible ceiling to a 4x4x2 1/2" square box with the appropriate single gang or double gang device ring for the wall material to be used.
    - b. Provide bushings on all conduits and sleeves.
    - c. Mount each location at the same height as an adjacent electrical outlet unless noted otherwise.
  4. Provide all ground wiring, connection to ground and a ground bar for the telecommunications backboard.
    - a. Provide a #4 AWG ground wire from the building grounding electrode conductor to the ground bar at the telecommunications backboard.
    - b. Ground all equipment and racks as required with a minimum #6 AWG grounding conductor to the ground bar.

### TELECOMMUNICATIONS

5. Provide plywood distribution boards as specified.
6. Provide all conduit, wiring, boxes, connections and coordination for connecting two dedicated telephone lines to the intrusion detection system digital alarm communicator transmitter.
7. Provide sleeves and fire-stopping for all through wall penetrations for telecommunications cabling.

### 1.3 RELATED WORK

- A. Section 16000 - Basic Electrical Requirements
- B. Section 16720 - Intrusion Detection

### 1.4 SCHEDULING

- A. Coordinate the installation with other sections and divisions and the Owner. Coordinate and comply with all requirements of all utilities. Provide timely notice to all on all work to be coordinated with others.

### 1.5 SUBMITTALS

- A. Submit manufacturer's literature for each type of product in accordance with Division 1.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Plywood backboard shall be 3/4" plywood painted on all sides with two coats of fire retardant paint.
- B. Voice and Data Outlets and Copper Cabling
  1. Horizontal voice and data cabling shall be Belden Category 5e UTP or approved equal. Provide Category 5e rack mount patch panels, Category 5e eight position eight-wire outlet modules, wall plates, wall phone mounting plates and blank inserts for all empty wall plate positions and all other necessary materials to make the wall plate location complete.
  2. Provide Category 5e - 4 pair 24 AWG (minimum) twisted pair for horizontal data and voice station cabling.
  3. Terminate all horizontal cabling on Category 5e outlet modules. The installed outlet module shall be rated to accept 6 position or 8 position modular plugs. Install the outlet modules in the top left position.
- C. Patch panels: All Category 5e cabling will be terminated on wall-mount 24-port patch panels. The cables shall be terminated in ascending order. Provide a rear mount strain relief bar for

## TELECOMMUNICATIONS

each patch panel installed to support the cable being terminated to the patch panel. Provide a one-position cable manager above and below each patch panel.

1. Provide separate patch panels for voice and data.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. The conduits shall be run in the shortest straight runs wherever possible. No section of conduit run shall be longer than 100 feet or contain more than two 90 degree bends. (A double offset is equal to one 90 degree bend.). For sections of conduit runs longer than 100'-0" or containing more than two 90 degree bends, or containing a reverse bend, pull boxes shall be provided and installed.
- B. Minimum radius of telephone conduit bends shall be as follows:
- |     |               |                 |
|-----|---------------|-----------------|
| 1.  | Size (Inches) | Radius (Inches) |
| 2.  | 3/4           | 6               |
| 3.  | 1             | 9               |
| 4.  | 1-1/4         | 14              |
| 5.  | 1-1/2         | 17              |
| 6.  | 2             | 21              |
| 7.  | 2-1/2         | 25              |
| 8.  | 3             | 31              |
| 9.  | 3-1/2         | 36              |
| 10. | 4             | 45              |
- C. Do not run conduits in the floor slab unless specifically shown on the Drawings.
- D. All conduits shall be left clean, dry, and free of debris or other obstructions.
- E. A pull rope shall be left in all spare conduit runs and in all empty conduits for use by utilities. Pull rope shall be rated to 250 lbs.
- F. Minimum conduit size shall be 3/4", but not less than specified or shown on the drawings. All conduit ends shall be equipped with insulated bushings.
- G. All telephones that are mounted on walls shall be installed so that the highest device necessary to operate the telephone is 48" AFF, unless noted otherwise on the drawings.
- H. Fire-stop around all conduits penetrating walls or floors. At all through wall and through floor penetrations for any conduits entering the telephone room, all conduit openings shall be sealed with a fire barrier sealant conforming to the electrical code (such as Nelson or Hilti fire-stopping products) to assure a positive seal against fire, smoke, rodents, moisture penetration.

END OF SECTION 16740

### TELECOMMUNICATIONS



## SECTION 16900 — ELECTRICAL SCHEDULES

### PART 1 - GENERAL

#### 1.1 LIST OF ATTACHED SCHEDULES

- A. Light Fixture Schedule
- B. Mechanical Equipment Schedule
- C. Panel Schedules

### PART 2 - PRODUCTS (Not Applicable)

### PART 3 - EXECUTION (Not Applicable)





PANEL SCHEDULE ~ P1						
VOLTAGE: 120/240V			200A MCB		PROJECT NAME	
1 PHASE, 3 WIRE			AIC: 10K AIC		MDOT KITTEY SCALES	
CIRCUIT BREAKER				CIRCUIT KVA LOAD		BRANCH CIRCUIT DESCRIPTION
CKT NO	BRKR SIZE	NO OF POLES	PH	A	B	
1	30	2	A	2.25		DWH-1
3			B		2.25	
5	20	1	A	0.50		LTG: EXTERIOR
7	20	1	B		0.50	LTG:
9	20	1	A	0.40		LTG:
11	20	1	B		0.36	RECEPT: SCALES OBSERVATION AREA
13	20	1	A	0.18		RECEPT: SCALES OBSERVATION AREA
15	20	1	B		0.18	RECEPT: SCALES OBSERVATION AREA
17	20	1	A	0.36		RECEPT: SCALES OBSERVATION AREA
19	20	1	B			SCALE CONTROLS, TRAFFIC LIGHT, LED DISPLAYS
21	20	1	A	0.36		RECEPT: WORK AREA
23	20	1	B		0.18	EF-1
25	20	1	A	1.60		AC-1
27	20	2	B		2.50	CU-1
29			A	2.50		
31	20	2	B		0.60	SEWAGE PUMP
33			A	0.60		
35	30	2	B		2.04	WELL PUMP
37			A	2.04		
39	20	2	B		0.90	ELEC. BASEBOARD
41			A	0.90		
SUBTOTAL:				11.69	9.51	
2	20	1	A	0.54		RECEPT & UH-1
4	20	1	B		0.72	RECEPT
6	20	1	A	0.90		RECEPT
8	20	1	B		0.90	RECEPT
10	20	1	A	0.90		RECEPT
12	20	1	B		0.72	RECEPT
14	20	1	A	0.54		RECEPT: REFRIDGERATOR
16	20	1	B		0.18	RECEPT: KITCHENETTE
18	20	1	A	0.18		RECEPT: KITCHENETTE
20	20	1	B		0.36	RECEPT: WORK AREA
22	20	1	A	0.18		RECEPT: WORK AREA - PRINTER
24	20	1	B		0.36	RECEPT: WORK AREA
26	20	1	A			SPARE
28	20	1	B			SPARE
30	20	1	A			SPARE
32	20	1	B			SPARE
34	20	1	A			SPARE
36	20	1	B			SPARE
38	20	1	A			SPARE
40	20	1	B			SPARE
42	20 LOCK	1	A	0.36		SECURITY PANEL
SUBTOTAL:				3.60	3.24	



LUMINAIRE SCHEDULE										
TYPE	DESCRIPTION	MFR	CATALOG SERIES	MOUNTING	VOLT	LAMP			KEY NOTE	
						QTY	WATTS	TYPE		
A	2-LAMP WRAPAROUND	METALUX	SA-232A-120-EB81-RIF1	CEILING SURFACE	120	2	32	T8 3000K		
B	3-LAMP WRAPAROUND	METALUX	SA-332A-120-EB82-RIF1	CEILING SURFACE	120	3	32	T8 3000K		
C	8' INDUSTRIAL	METALUX	8TIA-232-120-EB81-RIF1	CEILING SURFACE	120	4	32	T8 3000K	5	
D	WALL BRACKET	METALUX	BC-232-120-EB81	WALL 7' 0" AFF	120	2	32	T8 3000K		
E	4' VAPORTITE	METALUX	VT2-232DR-120-EB81-RIF1	CEILING SURFACE	120	2	32	T8 3000K	3	
F	4' INDUSTRIAL	METALUX	IA-132-120-EB81-RIF1	PENDANT 8' 0" AFF	120	1	32	T8 3000K		
G	WALL PACK	GUTH	SND-12-100-MH-1-PEC	WALL 8' 6" AFF UNO	120	1	100	HPS		
EXIT	EXIT LIGHT UNIVERSAL MOUNTING	SURE LITES	LFX70 SERIES	SEE PLANS	120VAC 12V DC	-	RED	LED	1	
1 - PROVIDE WALL, CEILING, OR PENDANT MOUNTING AS INDICATED ON PLANS. PROVIDE NUMBER OF FACES AND ARROWS AS INDICATED										
2 - NOT USED										
3 - UL LISTED FOR WET LOCATION										
4 - NOT USED										
5 - PROVIDE TWO LAMPS IN CROSS SECTION, FOUR LAMPS TOTAL FOR EACH FIXTURE										

MAINE DEPARTMENT OF TRANSPORTATION  
KITTEERY SCALE - SOUTHBOUND  
KITTEERY, MAINE

ELECTRICAL SCHEDULES

16900-2



MECHANICAL EQUIPMENT SCHEDULE											
EQUIPMENT	VOLTS	PH	HP	KW	MCA	DISCONNECT SW	STARTER	DIV. RESP	DIV. RESP	WIRING	SEE NOTE
						AMPS/POLES/FUSE/ENCL		STARTER			
AC-1	120	1	--	--	15.8	30/2/20/NEMA 1	--	15	15	(2)#12+(1)#12G	
CU-1	240	1	--	--	23	60/2/40/NEMA 3R	--	15	15	(2)#12+(1)#12G	
EF-1	120	1	--	0.172	--	20/1/NF/NEMA 1	--	--	--	(2)#12+(1)#12G	
DWH-1	240	1	--	4.5	--	30/2/30/NEMA 3R	--	--	15	(2)#10+(1)#10G	
(E) WELL PUMP	240	1	3	--	--	DIVISION 2	SIZE 1	2	2	(2)#4+(1)#4G	
SEWAGE PUMP	240	1	(2)@1/2	--	--	DIVISION 2	DUPLEX	2	2	(2)#12+(1)#12G	1
<b>NOTES</b>											
1. MOTOR FEEDER TO DUPLEX PUMP CONTROLLER SHALL BE BY DIVISION 16. MOTOR BRANCH CIRCUIT WIRING FROM CONTROLLER TO PUMPS AND FLOAT SWITCHES SHALL BE BY DIVISION 2.											

